

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

OCT. 20, 1952

50 CENTS

New aero plant is symbol of Honeywell growth

About a year ago, Honeywell's Aero Division was busting its seams all over Minneapolis. No wonder, then, that Honeywell, world leader in automatic controls since 1885, built this wondrous new plant to house its vigorous offspring.

Within these walls you'll find research and development labs—where tomorrow's aviation control problems are studied. Extensive environment test laboratories—where solutions to today's problems are given tough, practical testing. Production lines—where *proved* Aeronautical Controls are mass-produced.

And behind all of this are more than 4,000 employees, including highly trained research men and engineers of the Honeywell Aeronautical Division, who work with the very best equipment.

Our new plant is a symbol of 11 years growth. In that time our list of precision controls has grown from one, the world's first electronic autopilot, to a line that includes today's vastly improved autopilots for bombers, fighters and helicopters; also turbo regulators, jet engine controls, electronic fuel measurement systems, gyros, actuators and other control equipment.

And this list will grow—because *automatic control* is such an important part of aviation progress. And *automatic control* is Honeywell's business.

MINNEAPOLIS
Honeywell



Aeronautical Controls

RESEARCH *is the reason*

The new Engineering Research Laboratories at Hydro-Aire are considered the finest and most complete company-operated in their field. This division is equipped and manned to fabricate prototype parts from preliminary design, evaluate their performance under conditions simulating actual operation and to qualify the parts according to customer and military specifications—all without interference to general production.

As such, Research is an important reason why every fighter, every bomber, every transport is Hydro-Aire equipped.

HYDRO-AIRE *Inc.*
BURBANK, CALIFORNIA
Subsidiary of Crane Co.

MANUFACTURERS OF FUEL, HYDRAULIC, PNEUMATIC AND ELECTRO-MECHANICAL AIRCRAFT ACCESSORY EQUIPMENT

B.F. Goodrich



24 ~~26~~ airlines switch to new B. F. Goodrich dimpled tire

WE RECENTLY ANNOUNCED that twenty airlines had tested and switched to the new B. F. Goodrich dimpled tire. Now four other airlines report that they have adopted it as standard equipment.

One airline reported 2650 more landings on DC-4's. At typical airport from 2000 on a fleet of DC-3's. "We covered the new after 600 hours, 1200 landings. In the process of accepting, we discovered that there was enough rubber left for about 100 hours more, a total of 1200 landings."

The new B. F. Goodrich dimpled tire

has a longer lasting and construction which cuts down separation. It has a new tread with double-like indentation in the rubber. These dimples provide better distribution of the tire load and reduce exposure to road cutting. Retreading is simpler. Current regulations are easier.

The airlines landing on BFG dimpled tires include: American, Braniff, Capital, Central, Continental, Empire, Frontier, Hawaiian, Lake Central, National, Northwest, Pan-American, Philippine, Pioneer Southern, Southwest, Trans-World, United and West Coast.

B. F. Goodrich is now producing the dimpled tire in seven sizes. The new, longer wearing dimpled tire is another example of BFG's leadership in rubber research and engineering. Other B. F. Goodrich products for aviation include wheels and hubs, bonded rubber, De-Serts, Avtronic, Plastibond adhesives, Pressure Sealing Zippers, inflatable seals, fuel cells, Kivungu accessories. The B. F. Goodrich Company, American Division, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



"SEE YOU AT THE POLLS!"

Nobody knows for sure how it started — this line about "See you at the Polls!" we're hearing all over these days.

But explanations seem to be that it came from this star candidate out west. His opponents in a debate got all riled up and challenged him to fight it out in the alley.

But he said — "It's settle the AMERICAN way — I'll see you at the polls!" And the sentence picked up the chain.

Now everybody's saying it — and on Nov. 4 everybody will be doing it!



AIR ASSOCIATES
INCORPORATED

Teterboro, New Jersey

25 YEARS SERVING THE NATION IN AVIATION



"SEE YOU AT THE POLLS!"



"SEE YOU AT THE POLLS!"



NEWS DIGEST

Domestic

Donald W. Nyquist has resigned as director of the Civil Aeronautics Board effective Nov. 1, the White House announced last week. He had held the post since May 1951. President Truman said he had accepted the resignation with "deep personal regret."

Domestic aircraft passenger miles flown by scheduled carriers during the first six months of 1952 totaled 1,077,082,000, a 75% gain over the same period last year, reports Air Transport Assn. The carrier's six month figures are within a quarter billion miles of the total passenger miles flown in 1951.

Communications, Inc., Asheville, E. I. N. Y., has started construction of a small prototype of its "jet rotor" helicopter design. Ultimately the firm plans to build a 40-passenger, four-engine, five-blade, shrouded, passenger and cargo copter.

Civil Air Patrol rated personnel have reached a new high of 18,168, 15,735 being pilots and the remainder observers. Total CAP membership is 78,924 at 1,806 units having more than 3,500 aircraft. CAP is rising to reach 100,000 by Dec. 31, 1952.

Big Gov. Kevin O'Meara has been appointed director of the Aircraft Production Resources Agency. Capt. J. E. Dedmon, USN, has been selected Navy member of AFPA's executive committee, replacing Capt. Rex Jackson, USN, who will be stationed at Alameda Naval Air Station, Calif.

Pin Airplane Would Always? PWA R4568-TSBC engine, used on its Boeing Stratocruiser, will be overhauled and repaired to 40 configurations by Pacific Aerospace Corp., Portland. Contract extends through Nov. 15, 1952.

Five percent pay increase for all hourly paid employees has been granted by Kansas Aircraft Corp., Dodge City, Kan. In addition, pay raises for hourly paid job classifications have been agreed 5%.

More than 300 Boeing B-47s have been built by Boeing Airplane Co., USAF. Undercontract. Cigarette recently declined. He also stated that on the 300th B-47, production per period of aircraft was 1.7 compared with 14.5 for the first production Stratocruiser.



HI-TECH military tactics, using large engines, are being used by Marine Corps in Korea to launch the rocket battery.

USAF pilots flew 75 Republic F-84D Thunderbolt fighters between 7,500 to 10,000 hours in northern Japan, generally in four legs. Final landing leg from Midway was 2,575 as Air Force refueling was utilized.

Capt. Ray N. French, 66, World War I flying instructor, died in San Francisco Oct. 10. He was assistant commander of San Francisco Airport for two years in the early 1930s.

Civilian Airline's new DC-6 eight coaches are "being well for a new flight," says officials, and have no outstanding conflicts with the Bureau of Aeronautics, which is conducting a DC-6. This contract is reported in Aviation Week Sept. 20, p. 92. The Washington-San Francisco coach flight is landing a capacity load on Friday and Saturday, 50% loads on other days. New York-Washington-Montreal coach loads were reported excellent last week.

Coming series of jet transports is expected to have 200-600 mph, reports. Allen D. C. Berman, Aircraft Industries Assn. president, told the Wings Club, N. Y. He predicts that will remain the speed range for 12, 15 or even 20 years since an aircraft, says, the 900 mph, supersonic range, would require entirely new powerplants, airframe and structural materials.

Slack Airways' airline downturn has increased management that line of the Navy dash transcontinental C-46 contract to Flying Tiger Line won't last a bit, because they show common sense demand and about the capacity, and at higher rates. Common car-

rier 5-15 mile hourly and passenger carrier to a new location where King is assumed. Traffic makes it tough for many to access business.

range "in which we want to build the road for our long-term business expansion strategy." A Slack Airways' director told Aviation Week. The coordinated flight carrier is adding two transcontinental services and an extra weekend-Texas flight daily.

Financial

Boeing Aircraft Corp., Walling, Wash., has reported to raise the quarterly dividend from 30 cents to 25 cents per share. Div. 2 to holders of record Nov. 17. During the recently concluded fiscal year, net income totaled more than \$30 million compared with the previous fiscal year's \$21,797,523. Earnings at new \$200 million.

Northrop Aircraft, Inc., Hawthorne, Calif., reports net profit of \$2,000,000 for the six months to June 30 as in income totaling \$167,721,858. In fiscal 1951, Northrop earned \$1,275,057 on sales of \$99,894,697.

Pacific Aircraft Corp., Burbank, reports sales of \$10,858,784 for the nine months ended Aug. 31, a 20% gain over the same period in 1951. Net profit for the same period was more than \$677,000.

International

Canadian Dept. of Defense Production has placed written orders totaling \$957,000 during the first half of September, with latest order order, \$155,000, going to Bombardier of Canada Ltd., Dorval, Quebec, for engine overhaul.

ANGLgear supplements rotary actuator on TRIM TAB CONTROL SYSTEM



In some aircraft installations, ANGLgears supplement other Airborne products. The horizontal stabilizer trim tab control system is a good example of such an application.

A 3-way ANGLgear® right angle, bevel gear unit, an R-118 Rotator® Electric Rotary Actuator, two screw jacks and suitable linkage make up the system.

ANGLgears have hardened gears, ball bearings, flanged end mountings, 3-bolt side mountings, and an internal pivot on mounting ends. Ratio is 1:1. Lubricated for life.

Two basic sizes with three ratings are described in the L. A. S. Aeronautical Engineering Catalog. Consult it for dimensions and other pertinent information.



AIRBORNE ACCESSORIES CORPORATION

1414 Chestnut Avenue, Hillside 5, New Jersey

AVIATION CALENDAR

- Oct. 21—Av. Transport Section, National Safety Council, annual meeting, Conrad Hilton Hotel, Chicago.
- Oct. 24-Nov. 2—International aviation and travel exposition, Navy Pier, Chicago.
- Oct. 26—Los Angeles International Airport Air Fair and Open House, Los Angeles.
- Oct. 28-30—Transport Aircraft Division Section Conference, sponsored by NACA on Loc. Hotel Park Sheraton, Houston.
- Oct. 28-30—AIEE Av. Transport Committee annual meeting, Commodore Perry Hotel, Toledo.
- Oct. 28-31—METC conference on aviation tools, Tux York Hotel, Albany, N. Y.
- Nov. 4-7—National Tools and Instruments meeting, Society of Automotive Engineers, The Mark, Tulsa, Okla.
- Nov. 7-10—symposium on maintenance of aircraft, Western Union Auditorium, New York.
- Nov. 8—Annual Midwestern Tool Engineering conference, University of Illinois, Urbana, Ill.
- Nov. 11-12—Paper distribution/annual meeting, Lock Haven, Pa.
- Nov. 14-15—Associated Society of America symposium on aircraft noise, San Diego, Calif. (For details, write ASA, 37 E. 19 St., New York 22.)
- Nov. 17-20—National Aviation Under Age annual convention, Hollywood Roosevelt Hotel, Los Angeles.
- Nov. 19-21—Fourth Annual Safety Seminar sponsored by Flight Safety Foundation, Hawthorne, Nevada.
- Dec. 2—Symposium on light metal heavy forgings and extrusions for aircraft, SAE, ANSEL, IAS and AIAA.
- Dec. 3-5—Aviation Distribution and Manufacturers Assn. trade show meeting, The Knickerbocker, Miami Beach.
- Dec. 3-5—Security for Experimental Aircraft Association, annual meeting, Hotel McVey, New York.
- Dec. 10-11—Joint AIEE-IEEE-ACM conference on electronic computers, Park Sheraton Hotel, New York.
- Dec. 17—Annual Wright Bros. dinner, 7:30 p.m., Statler Hotel, Washington, D. C. Wright Bros. lecture to be presented by NAS 7 p.m., U. S. Chamber of Commerce auditorium.

PICTURE CREDITS

1—WPA; 2—AP; 3—NACA; 11—Orville Anderson; 12—Bureau of Aeronautics; 13—Opportunities; 14—AP; 15—AP; 16—AP; 17—AP; 18—AP; 19—AP; 20—AP; 21—AP; 22—AP; 23—AP; 24—AP; 25—AP; 26—AP; 27—AP; 28—AP; 29—AP; 30—AP; 31—AP; 32—AP; 33—AP; 34—AP; 35—AP; 36—AP; 37—AP; 38—AP; 39—AP; 40—AP; 41—AP; 42—AP; 43—AP; 44—AP; 45—AP; 46—AP; 47—AP; 48—AP; 49—AP; 50—AP; 51—AP; 52—AP; 53—AP; 54—AP; 55—AP; 56—AP; 57—AP; 58—AP; 59—AP; 60—AP; 61—AP; 62—AP; 63—AP; 64—AP; 65—AP; 66—AP; 67—AP; 68—AP; 69—AP; 70—AP; 71—AP; 72—AP; 73—AP; 74—AP; 75—AP; 76—AP; 77—AP; 78—AP; 79—AP; 80—AP; 81—AP; 82—AP; 83—AP; 84—AP; 85—AP; 86—AP; 87—AP; 88—AP; 89—AP; 90—AP; 91—AP; 92—AP; 93—AP; 94—AP; 95—AP; 96—AP; 97—AP; 98—AP; 99—AP; 100—AP.



HAVING BOUNCED over the horizon, AD-4 Sky raider (above) strikes the carrier's island with its right wing and ports by. Then it...

Skyraider Has Ups and Downs

SKIDS along the deck (right) roll heads over the side. To avoid a watery crash, the pilot...



GLUNS THE ENGINE to lift the nose. The AD...



LEVELS OFF and heads for Navy land base. After a safe landing, examination reveals...

AVIATION WEEK, October 26, 1952



DAMAGED WING-TIP having seen five feet torn off and the skids bent from its charred legs.

**Produced
to rigid
aircraft standards**

Shelby Seamless Aircraft Tubing

SHELBY SEAMLESS AIRCRAFT TUBING can be produced with ease, and it can be bent and shaped into almost any form. You can weld it into the most complicated joints, yet be sure that these joints will be 100% efficient. Made specifically for aircraft use, this tubing combines, in the highest degree, the factors of workability, strength and safety.

Shelby Seamless Aircraft Tubing has been manufactured in a special design ever since the industry started in this country. Our constant research program has developed the use of new and stronger metals, improved heat treating methods as well as superior inspection techniques that assure the highest quality tubing.

When you place your tubing requirements, we can give you the facts on Shelby Seamless Tubing. It is produced to rigid aircraft standards by the world's largest manufacturer of tubular steel products.

**NATIONAL TUBE DIVISION
UNITED STATES STEEL COMPANY, PITTSBURGH, PA.
(TUBING DEPARTMENT)**

2000-A LEXINGTON STEEL BUILDING, SAN FRANCISCO, CALIF. 94104
DETROIT 22-0001, LANSING 2-0001, NEW YORK

All Shelby Seamless Aircraft Tubing is selected from a solid block of high-quality steel. It is then manufactured under strictest controls and subjected to the most rigorous tests to insure uniform strength.



U-S-S SHELBY SEAMLESS Aircraft Tubing

UNITED STATES STEEL

WHO'S WHERE

In the Front Office

Dean E. Felt has been appointed director of engineering and assistant to the president for Jack & Hume, Inc., Cleveland, Ohio. He has been chief engineer for the aircraft accessories firm during the past three years. Joseph E. McMillan, formerly with Westinghouse's aviation engineering department, has joined Hall as chief project engineer and acting chief engineer. Ralph J. Eubank has been promoted to executive engineering manager. A. E. Moore has been designated vice president and director of research and development for K. M. Hollingshead Corp., Camden, N. J. W. M. Martin has been named director of engineering and industrial research and Dr. V. Esposito has been named director of new products development.

John R. McKinley has been named assistant to the vice president of Aero Equipment Corp., Bryn Mawr, Pa., maker of aircraft products, instrumenting equipment and structural tools. Prior to his promotion he had been aircraft sales manager.

R. M. Tuck is now vice president and manager for Aero-Electric Services, Inc., Miami International Airport.

Kempston Dean has been designated vice president with American Brake Shoe Co., N. Y. Dean, with the firm since 1912, formerly was vice president treasurer.

Changes

Victor Welge has been appointed associate director of engineering for F. R. Mulberry & Co., Indianapolis, Ind., and will handle electric, electronic and mechanical engineering work.

Arthur L. Mendenhall, Jr., has been appointed electronic aids engineer at Pacific Division of Bendix Aviation Corp., North Hollywood, and R. F. Kruse has been named assistant in the general manager of the division.

L. A. Duggan has been transferred to the Los Angeles office of Vapor Heating Corp., Chicago, to handle sales of Vapor tempering gas controls for power.

R. E. Cawford has been named chief inspector at the Greenville division of Timken Aircraft Corp., Tex.

Ray W. McMillan has been transferred to the W. Marshall Clark office of aircraft repair shop Co., of Wilford, N. H., maker of precision investment castings. His old title will be of these products and finished mechanical parts made by Thibault Aviation Corp., W. Hartford.

W. E. (Wally) Hume has accepted as Florida State Aviation supervisor and joined Southern Area Sales, Inc., Atlanta, Ga., as sales manager.

Robert A. Hall has been named assistant chief of Northrup Aircraft, Inc.'s Special Weapons division, Hawthorne, Calif.

Ronald Holbeck has been designated production manager of Panther Aviation Corp., Los Angeles and R. E. Vancampen has joined the firm as personnel manager.

INDUSTRY OBSERVER

► Special refueling wing tanks need for the eighteenth serial refueling of a Lockheed F-100 in Korea last year made it possible for the airplane to remain airborne 14 hr. 15 min. and fly five combat missions. The tanks, equipped with Flight Refueling Inc. gauges added about 160 gal. to the airplane's normal capacity and, time they were refilled from the drogue of a KB-29 tanker. Tanks had single overflow valves so pilot could see fuel contact when he saw fuel coming out of the valve.

► Suresco, French aircraft engine builder, are working on a new version of their 104 six-cylinder turboprop engine to be used at 8,500 lb. static thrust dry and 12,600 lb. with afterburner. Suresco reportedly is interested in the engine for an advanced version of the Mystere interceptors.

► Now shortly will release report on new data on the vapor streamlines in relation with the rocketing balloon concept in the Arctic in collaboration with Atomic Energy Commission. When huge balloons bearing sodium vessels reached their maximum altitude, the vessels were released to penetrate the atmosphere further and deliver oxygen gas data. Now reports that these experiments might have been responsible for the "flying saucers" viewed in the south in mid U. S.

► Fairchild Engine and Airplane Corp. is getting delivery within a month on the first two F-100 trainer which it is licensed to build in this country. Plans are to demonstrate the piston-engine S-11 and S-12 trainers, smaller light craft, in a new model and tubular version in September. Now, 10 more planes are to be shipped of the S-14 jet trainer and the S-13 twin-engine trainer to this country.

► Fiscal 1953 off-shore procurement trade actually will be less than the 1,700 European-built interceptors and eight fighters originally planned. Additional cost of spare parts and ground handling equipment for these planes will reduce total number of aircraft that can be bought with the \$400 million fund to somewhere between 1,700 and 1,900 planes. Planes will be bought in a "package deal" that includes a complete aircraft plus spares and special ground-handling equipment.

► A strong factor in the redesigning of the airplane designs is the fact that there is no longer any appreciable difference in the high strength that must be built into a airplane hull to stand up for water landing impacts and what is now required in the increase of fast land planes to give the loads and stresses of approach flight. Thus the airplane will no longer suffer from an inherent high gross weight that prevented good landplanes a consistent performance edge over their water-based competitors.

► A total of 11,300 jet engines have been built by Rolls Royce and its licensee in the U. S. and Canada. More than 10,000 hours of flight time have been logged on Rolls-designed gas turbines.

► Gloster estimates that it can produce the transonic Jetstream for about the same mass known gas turbine power and using completely the same gas turbine engine as the Meteor. Because the delta wing is relatively thick (23 ft.) at the root on the Jetstream and about 9 ft. on the Aero 650 conventional aircraft construction methods can be used. By increase in Jetstream cost will come from auxiliary equipment required for all-weather operations. Gloster is completing its third Jetstream prototype and will build two more, one for static test to destruction.

► British airline operators still are looking to the turboprop engine as their real money makes long before the turbojets begin to pay off. The Bristol Britannia will carry 184 passengers at 140,000 lb. gross weight and costs about \$1,550,000. Vickers Viscount can carry up to 55 passengers, gross weight 52,000 lb. and costs about \$600,000. In contrast, the Comet 3 series weighs 110,000 lb. gross, can carry 35-44 passengers and costs \$1,590,000.

Washington Roundup

Air Army: Bright Future?

There is a renaissance of spirit and aggressiveness in the Army. While Navy men talk of a "global air Navy," Army men enthusiastically talk of an "airborne Army."

- A changed military objective due to changed atomic national relations has enlarged Army's role in defense. The key to U. S. military strategy is now "holding land areas." Up to 1950 it was a "landlock" blow against Moscow. In that period, Army, like Navy, took a back seat while gears-pitching Congress grew mad, again poured Air Force funds for intercontinental bombers.
- Navy and Army now are eye-to-eye on basic military strategy, giving that conclusion the majority vote in the Pentagon. The old legend of Army & Air Force vs. Navy is over.

One top Army man explained:

"In huge wars, we believe strategic aviation will have a limited role."

"In an all-out war, it is well known that Russia's transportation system is poor at her eastern end, her central Europe or the Near East, we can assume that they will be well-defended and equipped to push forward for at least six months. Soviet armies could conquer a vast area in North Iran, and use its industrial output and facilities."

• Army position is gaining ground. Although USAF has received the biggest slice of military budgets for 1952 and 1953 fixed years—and will again next year—the emphasis in the USAF buildup has been on tactical weapons.

The issue between Army and Air Force is not land power vs. air power. It's a contest over "what type" of air power.

• Air Force has consistently backed Army air power. It has given a low priority to the troop and power from ports Army needs, and has balked at giving Army a center in setting up characteristics of the planes. USAF has held down against Army aviation with a weight limit ban (lifted a year ago), by opposing Army air funds and by lagging in the procurement of Army planes.

• Heart of the matter: Army and Navy are outwitting Air Force at the "air" end of the military strategy games. The new strategy are using those aircraft to have flexible, instead of cluttered into tactical weapons—fully loaded, loaded mobile weapons, atomic air-lift, industrial drive—and to hold down the attention for great battle, transportable task, in large strategic assaults.

Army Chief Reports

Even in the report of Army's outgoing undersecretary, Karl Bodenstein:

• Army Air—At this point in the mobilization program, Army aviation is just ready for its takeoff. Up to now priority has gone to fighters and bombers. But these programs are now well under way and the materials situation has eased.

• In 1953 fiscal year Army now gives \$118 million for aircraft to support its operations in Korea; that this dropped to \$50 million in 1952 fiscal year, and Army had only \$22 million for its organic aircraft this year.

The reason: USAF didn't agree to lift the weight limitation on Army aircraft in time for Army to put funds into the current 1953 fiscal year budget for large helicopters. USAF gave a low priority to expansion of the

helicopter industry. Then Budget Bureau turned down Army requests for funds on lack of production capacity.

• But Army plans a 1956 fiscal year aircraft program approaching \$100 million and a 1955 budget approaching \$100 million.

• \$250-Million Helicopter Program—Under its plans are frustrated, Army will launch a two-year \$250 million helicopter procurement program next July.

• Tachik and Tropic Transport—The tactical air program of the Air Force is "nothing much better."

Relates with USAF on the troop transport program "not approved over a year ago."

• Air Merchant Marine—Army considers an expanded civil air fleet for ground troop logistic support in war time a national defense "necessity." USAF will go as far as to call civil air expansion "desirable."

Army doesn't go as far, though, as Donald Douglas, Jr., vice president of Douglas Aircraft Co., who says air from port eventually will provide "complete" support for the old military establishment.

• Army Plans. Procurement—Army shortly will request Secretary of Defense Robert Lovett for authority to procure planes "peculiar" to its needs.

Bodenstein's position: "If a plane, or any other tool, is peculiar to one service and it can be shown that its procurement by that service will result in savings of time and money, and the two are related, there seems to be no sound reason for its procurement by another service."

Army's objective is authority to procure its small fixed-wing aircraft. Army types are almost identical with conventional types and can be readily obtained from manufacturers. Army sees no point in changing aircraft nations (through USAF), which does not utilize the type as equipment and is not familiar with them.

• Guided Missiles—Army has developments which it thinks eventually will "completely" lose the role of guided aircraft in air defense and on the battlefield.

They are aimed at replacing guided planes. For the foreseeable future, even the Army believes guided aircraft will be vital, particularly against maneuvering enemy plane formations.

The Army has its major projects which will provide a "complete family" of guided missiles and their rockets, some with atomic warheads, to be fired from deep in hostile territory against the enemy front line. Other Army missiles are aimed at bigger ranges to hit strategic targets.

Plant Expansion: Last Lap

Present expansion of the aircraft industry is about over. Of the \$4.5 billion granted Air Force and Naval Air for plant expansion and production, industry and equipment costs Korea, all but \$800 million has been obligated—\$600 million USAF, \$200 million Naval Air.

This will complete current programs, except for facilities required in the future for production of new types.

One to Stay?

Watch for New Britain to look toward keeping Assistant Secretary for Air John Pilling as its port, regardless of the outcome of the election. Navy has industry friends unfriendly in both parties, and, it is expected, will vote through them.

—Katharine Johnson



BRISTOL OLYMPUS TESTED IN this two-engine English Electric Canberra which is gathering flight data on the potential split-compressor engines. Installation problems have prevented engines from pulling full thrust capabilities from the Canberra experimental rig.

Split Compressors Usher in New Jet Era

• Thrust to 15,000 lb., low fuel use are advantages.

• U. S. and British push design and production.

By Robert Riets

London—American and British air frame manufacturers are combining heavily on the new generation of split-compressor (two spool type) jet engines to propel new types of transonic bombers, long-range transports and supersonic fighters.

Development and production of split-compressor jets in the 10,000-to-15,000-lb.-thrust class now is a major objective of engine manufacturers in both countries.

Big advantages of the split-compressor design lie in its combination of higher power with low fuel consumption. This dividend can be paid in a number of ways.

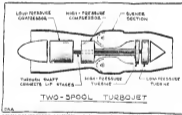
• For bombers it means longer range.

• For transports it means more on annual operations.

• For fighters it can mean other higher performance or longer range.

The design—Virtually every major aircraft engine builder on both sides of the Atlantic now has split-compressor design under development. Here is how the international lineup on these designs now stands.

• Bristol Aeroplane Co., Ltd., leads in



TWIN-COMPRESSOR MODEL is laid out in this simplified sketch showing basic features of new generation of engines.

England with its Olympus, now of finally rated at 3,750 lb. thrust dry but actually taking 12,800 lb. on the test stand. Bristol is tooling up its Tulsa works for Olympus production. It also works for Olympus production of the Avon design, together with other projects still on the test bed.

• Pratt & Whitney Engine Co., still no lower end for its centrifugal flow jets, will make its debut on the mid field with a split-compressor design by Frank Over, who originally laid down the Olympus at Bristol. The de Havilland model is well advanced in development and should push the 15,000 lb. mark.

• Rolls-Royce Ltd., which has pushed

its single-spool Avon through a variety of configurations and power ratings from 6,000 to 12,000 lb. thrust during the past five years, also has explored the split-compressor design aimed at bringing in a new engine class where the Avon development ends.

• Pratt & Whitney Aircraft will lead both in British and American competitors with its J57 already in heated production. For PWA delivery is due on the J57 would be classified as substantial production in British standards but as only preproduction by American measurements. PWA was now well along on tooling for logistic produc-



BRISTOL GL3MPLS split-compressor turboprop is rated at 9,700 lb. thrust.



BRISTOL OLYMPUS, side view, shows 40-in. diameter, 125-in. length.



The GE J47 with accessories, a typical centrifugal single-compressor type.

ties of advanced models of the J57 both in its first turbojet plant and in Chicago where Ford will build the J57 turbojet.

Early model J57s that powered the experimental B-52 and B-60 nightjet bombers were rated well below the published thrust of the Olympus, but F&W will get into production on a 10,000-lb thrust version and has orders under development leading to the 15,000-lb dry-thrust J75.

•Wright Aeronautical Corp. has designed a new split-compressor jet in the 12,000-to-15,000-lb class based on the original Olympus data obtained under license from Bristol. The C-W J37, however, is a new design, not just a scaled-up Olympus.

•Westinghouse is working on a split-compressor version of its basic J40 design rated at about 12,000 lb. thrust.

•General Electric has a split-compressor design in the early development stage and is exchanging technical information on this and other subjects, notably sodium action, with de Havilland.

•Allison Division of General Motors has been exploring split-compressor designs, but little is known of its specific projects.

•Why the Split-Drive advantage of the split-compressor design is its ability to produce higher pressure ratios. It seems likely that the split-compressor design is now taking over from the single-shaft units above the 10,000-lb thrust mark in much the same manner that the later supercharged centrifugal flow types above 5,000 lb. thrust.

Features of the split-compressor design to be primarily on large aircraft such as bombers and transports that will still operate primarily in lower portions of the transonic speed range, although there are some advantages of the type engine for fighters going into upper speed ranges.

At higher transonic speeds it is likely that the ram effect will take over a good share of the actual compression level, thus requiring smaller compression intensities in turbojets.

The split-compressor, now at the beginning of its development cycle, already offers pressure ratios 50% higher and specific fuel consumption 15% lower than the best single-shaft units already far along in their development cycle.

During early positive research on dual compressors it became evident that one is faced on the basis of an axial compressor that would operate satisfactorily over the normal range of altitude and speed regimes of turbojets. This limitation seemed to leave at present state of about eight to ten and 15 stages of compression.

•Avoids Blade Stall-Splitting the compressor internally and having each of the two compressors independently with



BURMA-BOYCE AVON TESTED: Engineers test engine having afterburner.

upstream features allows the compressor to be operated at different rpm at the same time. This avoids the blade stalling problems encountered in the single-shaft compressors where the entire compressor must always operate at the same rpm. In the split-compressor design each compressor is loaded with a separate turbine through concentric shafts and there is no mechanical connection between the high and low pressure shafts.

Pressure ratios as high as 12 to 1 have been obtained from split-compressor engines with specific fuel consumption lowering to 7 lb. of fuel per joule of thrust per hour. The lower fuel consumption results from the higher pressure at which air is introduced into the combustion chamber.

Early approach to the control problem on split-compressor jets has been to regard the high-pressure unit as an upstream engine and its flow controlled solely at regulating this unit. The theory is that the high-pressure unit will bring along the low-pressure unit without any additional control. If successful this will mean a considerable power requirement for starting the engine and an extremely fast acceleration. Test stand operations have shown that acceleration from idling to full power is possible in three seconds.

Both-Rover experimented initially with multiple stages of compression using two centrifugal flow units in its Clyde turbojet and now uses a pair of centrifugal compressors in the pro-

duction models of the Dart turbojet. However, proceeding on two stage axial compressors was done by Pratt & Whitney Aircraft and Bristol working independently at about the same time.

•Production Problems-The F&W J57 made its first test stand run as a complete engine in January 1953 while Bristol reached the milestone with the Olympus six months later. The J57 first flew in April 1953 in a B-50 freight hauler jet while the Olympus took to the air in early August 1953 in a general test. Both engines continue. F&W J57 production is at least a year in advance of Bristol's progress.

Tooling and production of the split-compressor units pose some logistical problems because of the wide variety of parts they may have such as shafts, casings, and casings. Most of the tooling required for the high-pressure unit has to be specially designed and built.

Comparing J57 and Olympus versions of about the same thrust, it appears that the Olympus weighs less and has lower compression ratios. The J57 weighs more, primarily because of its additional compressor stages and more extensive use of stainless steel, but produces a higher compression ratio that gives it an edge in fuel consumption.

Comparing the Olympus with the 10,000-lb thrust Avon, it is evident that split-compressor units tend to weigh more because of the heavy cas-

ings required and the heavier shafts and particularly for cranks. However, the Olympus develops more thrust with lower stages of compression and has substantially lower fuel consumption.

•Need Afterburners-Because of the lower engine weight and its higher specific thrust as a fighter aircraft, the Royal Air Force still favors single-shaft units for its current crop of fighters. To get transonic performance in level flight from the Hunter, Swift and Javelin, afterburners will be required for the Avon and Supersonic. Both and Avon strong Javelin are not tailoring afterburners to fit their fighters.

Reversal, F&W and Wright are also developing afterburners for their split-compressor jets and the U.S. Air Force plans to use the J57 and J37 with afterburners in its next generation of supersonic fighters and there are plans for Air Force and Navy bomber applications. This is especially true for the flow through the split-compressor engine higher percentage of power remains possible with an afterburner. Afterburners producing as much as a 40% increase over base engine thrust are in development for subsonic bombers.

•Other Investigations-There is a good deal of talk in England about the future of the ducted flow variation of the turbojet fan axial unit, particularly at transonic speeds. Rolls-Royce has been the leader in concept of the ducted fan and is building an experimental engine incorporating this device.

The British engine industry is heavily engaged in a wide variety of other type turbojet developments such as the turbofans, rockets and rockets. The short-life turbojet is designed for use in jet-powered thrust reversers, missiles and short range, strap-on-thrust interceptors. Some experiments are being made to build the ducted fan unit at cheaper and less desirable methods and then operate them at higher transonic speeds over an engine life of only 10 to 20 seconds. But the ducted fan unit and its delay are all well known on short-life jets.

In the rocket field de Havilland has achieved considerable success with its Spectra, particularly in the design of a rocket engine. At Bristol, the Spectra is another example to the same problem tackled in its Spectra rocket. Rocket applications are aimed for additional power in secondary thrust, operating at altitudes where engine efficiency declines rapidly and the engine is used.

Bristol which took over Rover's jobs on the Gerni project, and Vickers are active in rocket development.

•Production Picture-It is difficult to tell the development of the British engine industry is still working hard on the problem of getting its order job, the Avon and Supersonic, into the state of

service as the plating at most airlines on fuel and rates. The big four—American, Eastern, TWA and United—were settled on a compromise (non-subsidized) rate Sept. 19 last year. "Since that time the Board has established 42 final fuel rates and 36 nonfuel rates for a total of 78 final rates handled in a period of less than 13 months."

In addition, there are five final fuel rates open, which substantially all of the work has been completed as indicated by the number of show more orders." Nynex compares the speeds at which the damage has been done in Board Chairman against the handling of only 40 fuel rates throughout fiscal 1981.

CAB has urged the government \$11.311,000 in refunds from setting of new and lower maximum fuel rates since Sept. 19 of last year, Nynex says.

• **New Airlines Allowed—**Allowing changes that CAB has closed the door on new entrants. Nynex notes that CAB has allowed certification to 41 airline applicants since 1958. These airlines are:

- **Local service—**Alaska Airlines, Air Commencing (not allowed), Airwest (merged into Frontier), Braniff, Coastal, Chalkley (merged into Frontier), Chautauque (never flew), Express (merged with West Coast), Florida (not re-authorized), Island Air Ferry, Lake Central, Mid-West (not reauthorized), Mohawk, Missouri (merged into Frontier), Oshkosh, Pasha (never flew), Piedmont, Frontier, Pacific (never authorized), Southern, South-west, Trans-Texas, West Coast, Wiggins, Western Central.

- **Charters—**Alaska Airlines (never authorized), Tingo, Tingo, Reddy, Slack, U.S. Air Lines, Airwest and Air America.

- **Special services—**Reagan, Mackay, Midair.

- **International, overseas—**American

Domestic (merged with Pan Am), Canadian Atlantic, Trans Pacific.

- **Metropolitan center services—**Midair, Air Service (Chicago), Los Angeles Airways, New York Airways, Ted Low Cab Co. of Cleveland (never flew).

F-89 Is Grounded, Plane Under Study

Northrop Aircraft, Inc., has engaged a team of technical experts to study structural problems of the F-89 Scorpion as part of an extensive investigation into the series of recent accidents involving this aircraft.

• **Edgar Scheibel, director of North American Aviation, Inc.,** fighter and now a consultant in Los Angeles.

• **Capt. Willy Dahl, retired Navy structural authority.**

• **Dr. J. M. Franklin, a metallurgy and aircraft structure specialist on leave from Chance Vought.**

Other phases of the investigation involved static testing of a complete F-89C and a wing structure at Wright Field and altitude flight testing at El Centro, Calif. Air Force has grounded all F-89s pending outcome of the investigation. There have been no accidents involving structural failure of F-89C aircraft since last summer. The grounding exempts aircraft required for flight testing and emergency air defense missions.

The Air Force has not yet made a decision regarding the flight status of the F-89D.

The first deliveries of this model are scheduled for November. Northrop has a production program on the F-89D ongoing until the end of 1983 when initial production of the Cosmos F-102 is expected to take over the principal air defense role for USAF.

Atlantic Cargo Case Faces New Delay

Killing off hopes of Subland & Western, Transcon and European Airlines for early certification, CAB has decided to order another lengthy "technical investigation case" out of their application to provide non-subsidized trans-Atlantic cargo service. The case started five years ago.

Subland and Transcon, after denial of their applications, were reopening of their cases this summer on grounds that Defense Department supporting testimony had been disregarded in the "test" and that laws had changed since the original hearings some years ago. Then President Reagan consolidated European Airlines' similar application with reopening of the Subland Transcon case.

After several months' deliberation, CAB has decided to open their case to all concerned. That means at least another year's government deliberation.

Crucial in that the case will be delayed for 1984 submission, according to Washington attorneys who figure there to be five years for the domestic airlines' successful challenge CAB investigation.

Airline Shakes Up Its Top Command

U.S. Airlines' voluntary intergroup and financial reorganization, aimed at reviving the empty carrier, brought in Fred A. Miller as president. He is a former director and vice president of Flying Tiger Line and recent chairman of revived contract carrier Air America. U.S. Airlines was certified by CAB as 100% all-American service between the northeastern states and Florida Gulf Coast area. Seasonal traffic troubles combined with early stock market problems and subsequent management problems to keep the carrier in financial trouble. Founding president was Harry Fordham Florida promoter, and James Watson, former of Alaska Airlines, filed that office last month.

Director appointed Lyle P. O'Rourke as chairman and general counsel. William E. Huggins and Joseph E. Griffin were selected as director and treasurer respectively.

Mackay Trophy Awarded

USAF's Mackay Trophy for 1981 has been awarded Col. Fred J. Adams for setting a world's record of 615.6 mph around a 105-lap closed course at the National Air Races in Detroit last year. Adams flew a North American F-86. Previous work for the distance was set by the late John Derry in 1948 at 585.5 mph.



ENGINES DELAY X-3 TESTS

Douglas X-3, hypersonic research aircraft now of Edwards AFB, Calif., is shown here in artist's impression of the actual craft. Plans to powered by two Westinghouse J40 turbojets, although some early reports have listed powerplant as combination of turbojet and rocket. X-3 has been ready for flight

for some time now, but difficulties in engine installation have held back flight. Douglas pilot Bill Bridgman is to fly the X-3 during the research program, aimed at extending the range of flight observations gathered by the earlier Douglas Skyrocket in the supersonic speed range.

POWER

technical bulletin

WEIGHT

POWER



WEIGHT

Genetic output per pound is the constant objective of the aircraft designer. EEMCO serves this goal by turning out new electric motors with increased power, decreased weight and all the required operating characteristics. This tough new lightweight for driving a compressor was built to the latest Army and Navy specifications. Operating on 27 volts D.C., it provides 3 horsepower under continuous duty at sea level, 25% h.p. at 50,000 feet with duty cycle of 35 hours on—15 hours off. It weighs only 12½ pounds with integral gear box of 25% to 1 reduction.

Desired plant capacity and new delivery costs. EEMCO to keep pace with the growing need for these specialized designs. Today EEMCO motors and actuators are based on virtually all U.S. Aircraft.

Desired plant capacity and new delivery costs. EEMCO to keep pace with the growing need for these specialized designs. Today EEMCO motors and actuators are based on virtually all U.S. Aircraft.

ELECTRICAL ENGINEERING & MANUFACTURING CORP.

4612 West Jefferson Boulevard
West Athens 16, California

Pulse of air-to-air fueling!



Vard built pressure nozzle assembly designed by Boeing to transfer gasoline at maximum rates of flow during in-flight refueling from Boeing KC-97 tankers. Complete refueling is accomplished in record time to power a bomber or fighter to its target and return.

Vard
PASADENA, CALIFORNIA

Designs and manufactures all:

- BALL-BEARING AND GEAR ASSEMBLIES
- ELECTRO-MECHANICAL ACTUATING MECHANISMS
- HARDWARE AND GROUND POWER-UNITS AND WORM GEARS

AERONAUTICAL ENGINEERING



EXCEPTIONAL PERFORMANCE: even wide altitude and speed ranges have gained super priority rating for RAF all-weather fighters.

Why Gloster Gave Javelin a Delta Wing

- Only a triangle shape could give required all-weather fighter performance, company engineers figured.
- Design permits high speeds at high altitudes, low speeds at low, and fine over-all maneuverability.

By David A. Anderton

Hocknorton, England—The Gloster Javelin, world's first delta-winged jet fighter, is going to be England's prime defensive weapon against high-altitude enemy bombers.

Designed as a heavy interceptor and patrol fighter, with all-weather capability and extreme range built in, the Javelin is at the start of what promises to be a very interesting career. In its current state, it marks the transition between the non-satellite interceptor of the current Meteor N.9.11 type and the complete autonomy of tomorrow's generation of guided anti-aircraft missiles.

After the recent BRAC display at Farnborough, Armstrong Whitworth's executive editor, Robert Holt, and I visited the main works of Gloster Aircraft Co., Ltd., here in Gloucestershire, near the rolling hills of the Cotswolds. It is here, where Gloster has built every of

the fighters that have made its name famous, the company will build the Javelin.

At the time of Armstrong Whitworth's sale, the Javelin was still on the production line—internal details, including structural arrangements, were classified. They also meant there could be no cockpit examination and that Gloster people were considerably restricted in answering questions. Therefore, while a major part of this story is based on notes taken at the Gloster plant, information gleaned from study of released photographs has also been incorporated for greater completeness.

• **Javelin Genesis**—The Gloster G.4, 5, later to be named the Javelin, was designed to Air Ministry specification F.9/46, issued in 1946. The first prototype aircraft made its first flight from Marton, Lincolnshire, on Feb. 23, 1947. Three years later, on Nov. 29, 1951, 8-144 W. A. Watkinson was the pilot on this and most of the subsequent test flights.

Gloster chose the delta layout because this was the only geometry which would break the necessary performance for an all-weather fighter based on current knowledge of structures and aerodynamics. If for general reasons why the British like the delta layout, see *Armstrong Whitworth* Sept. 22, p. 22.

The resulting airplane, Gloster engineers assumed, would be able to show high speed at high altitude and low speed at low altitude, with exceptional maneuverability all the way along. This performance versatility was needed, because in Watkinson's words, "You don't have to go like bloody hell all the time—you might have to shoot down an old piston-engined bomber."

• **Designed Gloster-Finlay** layout of the Javelin showed a 72-ft wingspan, a 57-ft overall length and a maximum ground-altitude height of 17.3 ft.

Engines are a pair of Armstrong Siddeley Sapphire turbojets, rated at 3,350 lb. sea level static thrust each.

A reasonable estimate of the gross weight might be 27,000 lb. which would result in a wing loading of about 30 pounds per square foot on the Javelin's gross wing area of about 920 sq. ft.

The Javelin is one delta configuration which might be considered in a sweptback cowl with the trailing edge

**Aircraft
Large A Bolts?
BRILES
Makes Them**

N.A.S. 464 now thru sixteen dia.
AN-9 thru 16 . . . AN 179 thru
186. We have blanks in stock for
short runs . . . ready to finish material
on hand for long runs.



1. Almost Quality Alloy steel.
 2. Cold-Heated—No Decarburization.
 3. Threads rolled after heat treating to make grain flow follow the threaded contour for greater strength.
 4. Precision finished to specifications.
 5. Finished product rigidly inspected.
- All of this adds up to BOLTS that will withstand greater stresses and strains than specified or required.

Please write for our monthly stock list of A.N. and N.A.S. Bolts.
Bureau Dept. Russell & Co., Inc. Box 1000 N.Y.

COLD HEADED BOLTS
3/16" to 1" Dia.
BRILES
MANUFACTURING
CORPORATION
1100 BROADWAY
NEW YORK
CALIFORNIA



BANKING JAVELIN shows flat, wide based leading and round air section



STANDING JAVELIN shows low angle of incidence. Constant tailpipe line in this early picture of prototype with late picture of same plane, p. 21.

portion of the wing and tail filled. Controls are completely conventional, there is a horizontal tail with elevators and the only wing control surfaces are ailerons.

► **Credit Due**—The short time of three years between summer of the spec and the first flight of the airplane reflects great credit, not generally appreciated, on the Gloster design team.
Along with many others, I shared the impression that the Javelin was a flimsy Suckley Group venture, with Gloster's postwar record usually to building an airplane around the AS Supersonic to an even more dubious event.

Such a belief completely underestimates the tremendous effort of the Gloster technicians and the widespread group of the Royal Aircraft Establishment.

In fact, a close look at the aerodynamic configuration of the Javelin shows two basic differences from the Avon 707 research craft. One is the use of the horizontal tail on the Gloster much necessary in the tight maneuver required of an all-weather fighter. The second is in the leading edge—the 707 has none—to increase the drag and reduce the risk in landing.

► **Wing Detail**—Basic triangle which fences the gross wing area of the Javelin has a 53-in. base (slapped by rounded corners to the 51 in. span of the plane) and a 32 in. chord, or root chord. A symmetrical airfoil section is used, with root thickness-chord ratio about

5%—Leading edge radius is generous. Sweepback angle, measured at the quarter chord point, is about 46 deg. Large gaps are fitted to the undercenter of the wing, well forward of the trailing edge. Thin position maintains trim changes when the flaps are deflected. Forward air brakes are located on both upper and lower surfaces just forward of the trailing edge.

One of the criticisms of delta aircraft is the limited range of gravity travel. On the Javelin, the G-107 is not critical for any compensated landing conditions. Even though the percentage travel is lower than usual, the physical distance is much larger (because of the large root chord) than on the Meteor, for example.

► **Forward Scheme**—Flat air and radars are on both sides of the fuselage mounted between the twin Supersonics. Flat visibility should be good forward, to the sides and down, but aft it should be like looking through a tunnel. The radars, which should be watching for instruments in pairs, has only a pair of periscopes on each side and one set only directly ahead.

The forward layout of the pilot's controls most of the acoustic equipment necessary to the function of the Javelin. An interesting point is the very small radius of the nose tip, compared to U.S. practice. This means that unless the British have learned much more than we have about solving radar re-

EXPERIMENTAL RUNS
one of your stamping
problems?

**MODEL "L"
CECOSTAMP**



When you are required to turn out a small quantity of completely assembled units with all the accuracy and finish of final production, a CECOSTAMP can do the stamping jobs for you—accurately and economically. CECOSTAMP's versatility and accuracy, plus economical zinc alloy dies, combine to give you both satisfactory work and savings.

HERE'S AN EXAMPLE OF CECOSTAMP OPERATION

Pressing zinc disk panels for "mushroom" is a new kind of one of the particular ones was accomplished with a maximum of time and expense, using zinc alloy dies on a 360° x 48" CECOSTAMP. The impact blow at the CECOSTAMP forces the part precisely and true of spring back, making it ideal for development and "molding" work.

Cecostamps are air-operated impact drop stamps on which a wide variety of metal shapes can be made. Accuracy of the impact is completely and instantly controlled by the operator. Low maintenance, operating economy, run accuracy and the use of zinc alloy dies are engineered features of CECOSTAMP. Write for a copy of Bulletin 38-L-0.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

CHAMBERSBURG
CECOSTAMP

inches problems, or they pay less attention to them.

► **Powerplants**—The Supphenes are installed with three thrust lines not parallel, but converging towards the nose. The intakes are oval-like, and straight-through flow provides a high pressure recovery—about 95%—of the compressor inlet. Package boundary layer is separated from the inlet so is a fair ramp just ahead of the intakes on the fuselage, and by the distance between the cowl surface and the air intake.

Afterburners are not fitted, but Gloster may have to research the current trend—cooled battery by bleed design—and supply them.

► **Tail Assembly**—The swept, low-aspect-ratio vertical tail of the Javelin is supported by an adjustable surface (not to be confused with the all-flying tail on the late North American Sabres, for example) controlled by the main landing wheel in the midspan. A fitting for a gyrocompass struts into the tail assembly, the finroot is temperature, and the fin is curved when the plane completes dogging tests.

There was some trouble with buffeting in flights of the first prototype, traced to leakage of flow at the fuselage-tail intersection. On the prototype, the Supphen's baggage bay was lengthened to a vertical knife-edge in-

tersection, instead of being cut back at an angle. This modification cured the buffeting and increased somewhat the critical Mach number of the aircraft.

► **Other Details**—The reusable landing gear is the liquid-spring type built by Davy Equipment, Ltd. The main wheels, with a tread of about 25 ft., retract inboard, the nosewheel extends aft. All gear doors close against gaps while the plane is on the ground, an attempt is made to reduce drag slightly at the expense of extra complexity.

There is no indication of armament on the second prototype, although there is enough space in the fuselage to carry anything currently contemplated as offensive weapons. This includes the four 10-mm cannons specified for most of Britain's new generation of fighters, and the six to six missiles which must be coming along in the next few years.

All examples of the Javelin are power-boosted hydraulically.

► **Simple Structure**—It will reveal no secrets to us that the Javelin structure is simple and unconventional. About the only departure from time-honored practice is in the lack of spars or stiffeners, all wing loading loads are carried through a single beam. The root flange gives enough dimensions to make a very rigid structure in torsion, and in fact this torsional stiffness is one of the inherent values of the delta wing.

Gloster will complete five prototype Javelins before handing out its first production planes. The first prototype (serial WD 501) was damaged by fire following an accident; the machine was recovered only because of Waterton's heroism. He had been making high-speed flight runs when clockwise buffet started, became violent and ceased when both elevators ceased work. We surmise, with little control left in pitch, climbed to 10,000 ft. and found that he could manage to get some control down to about 1900 ft. his second landing speed.

He decided to land rather than abandon the machine and set back the test program. But the subsequent high speed of landing was too much for the landing gear, which failed, and the hooker cut immediately. Waterton managed to get out and was later awarded the George Medal for heroism.

The second prototype (WD 502) was the demonstration craft at Farnborough, has been flying since Aug. 21, and is currently in an extensive test program. It will shortly be joined by the third prototype. One of the reasons, say, two will go for structural tests and eventual destruction on the test frame and the fifth will serve as an uncompleted work.

► **Flight Performance**—Specific performance data on all curves, classified. Transonic speed is an obvious "must" for such a craft, so is a high degree of

You Can Fly Anywhere

With this Pair!



**Socany-Vacuum
Credit Cards
Honored Nation-wide,
World-wide!**

AT AIRPORTS here and abroad, the Signs of the Flying Red Horse is also a sign of friendly service and friendly credit. Your Socany-Vacuum credit card is honored wherever you see this sign. Contact local office for your card.



Signs of Safety and Performance ...

AT HUNDREDS OF AIRPORTS

SALES: CLEVELAND, OH. (216) 398-1000; ALBANY, N.Y. (518) 335-1000; ALBUQUERQUE, N.M. (505) 242-1000; ANCHORAGE, ALASKA (907) 243-1000; ARIZONA (602) 243-1000; ARKANSAS (501) 243-1000; CALIFORNIA (415) 243-1000; COLORADO (303) 243-1000; CONNECTICUT (203) 243-1000; DELAWARE (302) 243-1000; DISTRICT OF COLUMBIA (202) 243-1000; FLORIDA (305) 243-1000; GEORGIA (404) 243-1000; HAWAII (808) 243-1000; ILLINOIS (312) 243-1000; INDIANA (317) 243-1000; IOWA (319) 243-1000; KANSAS (913) 243-1000; KENTUCKY (502) 243-1000; LOUISIANA (504) 243-1000; MAINE (603) 243-1000; MARYLAND (301) 243-1000; MASSACHUSETTS (617) 243-1000; MICHIGAN (313) 243-1000; MINNESOTA (612) 243-1000; MISSISSIPPI (601) 243-1000; MISSOURI (314) 243-1000; MONTANA (406) 243-1000; NEBRASKA (402) 243-1000; NEVADA (702) 243-1000; NEW HAMPSHIRE (603) 243-1000; NEW JERSEY (201) 243-1000; NEW MEXICO (505) 243-1000; NEW YORK (212) 243-1000; NORTH CAROLINA (704) 243-1000; NORTH DAKOTA (701) 243-1000; OHIO (216) 243-1000; OKLAHOMA (405) 243-1000; OREGON (503) 243-1000; PENNSYLVANIA (215) 243-1000; RHODE ISLAND (401) 243-1000; SOUTH CAROLINA (803) 243-1000; SOUTH DAKOTA (605) 243-1000; TENNESSEE (615) 243-1000; TEXAS (214) 243-1000; UTAH (801) 243-1000; VERMONT (802) 243-1000; VIRGINIA (703) 243-1000; WASHINGTON (206) 243-1000; WEST VIRGINIA (606) 243-1000; WISCONSIN (414) 243-1000; WYOMING (307) 243-1000.

for
**AIRCRAFT
STAINLESS**



for
**AIRCRAFT
ALLOYS**

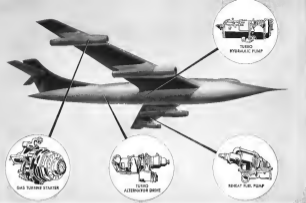


Alloy and stainless steels for aircraft production or maintenance requirements are immediately available from your nearby Ryerson Plant.

Our stocks currently include aircraft quality bars, sheets and strip in over 400 sizes, finishes and conditions. Also more than 300 types, shapes and sizes of aircraft quality stainless. So for quick steel shipment—aircraft or standard analysis—

Call RYERSON

12301ST STREET, NEW YORK, NEW YORK 10001; PHOENIX, ARIZONA (602) 243-1000; CLEVELAND, OHIO (216) 398-1000; PITTSBURGH, PENNSYLVANIA (412) 243-1000; ST. LOUIS, MISSOURI (314) 243-1000; SAN FRANCISCO, CALIFORNIA (415) 243-1000.



GAS TURBINE STARTER

TURBO ALTERNATOR DRIVE

TURBO FUEL PUMP

TURBO HYDRAULIC PUMP



TURBO HYDRAULIC PUMP bleed air from jet engine compressor to supply hydraulic power for entire airplane.



TURBO ALTERNATOR DRIVE bleed air from jet engine compressor to supply electric power for entire airplane.



GAS TURBINE STARTER operates on expanding gases from solid jet engine to give fast starts, without ground power.



TURBO FUEL PUMP bleed air from jet engine to supply entire flow of fuel for afterburner operation.

New G-E Accessory Equipment for Jet Aircraft



EXPERIENCE—G-E has been developing and producing aircraft turbines since Dr. Von Braun developed the first rocket-engine design (1930).

Units Can Be Designed For Any Size Airplane

DESIGNED FOR JET AIRCRAFT, new aircraft accessory turbines produce reliable auxiliary power under all conditions. Each product in the line features a high power-to-weight ratio and occupies a relatively small space. All are self-contained and can be easily removed for maintenance.



TESTING—Accessory turbines are tested under simulated operating conditions. Shown above is turbo-pump (11110).

Saves Weight, Space, Maintenance Time

RANGE OF APPLICATION for these turbines is unlimited. They can be designed for the smallest fighter or the largest bomber. However, each individual airplane determines the detailed specifications that the design will be designed for. It is important, therefore, that consideration of the design be given when airplane design is beginning.

THE NEW LINE of turbine-driven auxiliary power at the present time includes: (1) air turbine starters for alternators and turbo-hydraulic pumps which can be conveniently located anywhere aboard the airplane, (2) air turbine driven solvent (afterburner) fuel pumps which allow climb rates of thousands of feet per

minute, and (3) gas turbine starters which start engines within seconds, without ground power.

OTHER ACCESSORY TURBINE PRODUCTS are now in the design stage. In developing these new aircraft accessory turbines, G-E engineers are applying the knowledge of 35 years of developing and building aircraft turbines. This experience plus the engineering and know-how of General Electric is at your disposal to help solve your auxiliary power problems.

For more detailed information contact your nearest General Electric Aviation Representative, General Electric Company, Section 220-61, Schenectady 5, N. Y.



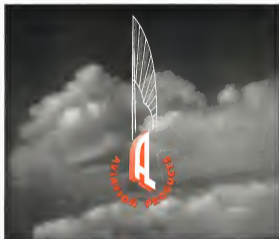
SERVICE—G-E service shops are strategically located for aircraft and turbine and accessory equipment overhaul.

FOR MORE INFORMATION

Please describe your detailed information on G-E Accessory Equipment one electric representative of the following: Write General Electric Company, Section 220-61, Schenectady 5, N. Y.

- GEA 5815 Accessory Turbines for Jet Aircraft
- GEA 5816 Air Turbine Drives for Jet Aircraft
- GEA 5817 Aircraft Afterburner Fuel Pumps
- GEA 5818 Aircraft Gas Turbine Starters

GENERAL ELECTRIC



...proven ability to serve Aviation

OUTSTANDING records of accomplishment achieved by Auto-Lite thru ever continuing research and advancements in products and production methods point to Auto-Lite

as a logical source of supply for the aviation industry. Engineering, production and design facilities are available.

THE ELECTRIC AUTO-LITE COMPANY
Detroit, Ohio



Manufacturers of...

BATTERIES • BURNERS • FUEL PUMPS • ROVERS • GENERATORS
IGNITION UNITS • SYNCHRONIZERS • ENGINE-DRIVEN PUMPS
PUMPS • IGNITION SWITCHES • INTERCOMS • GEARBOXES
IGNITION UNITS • INSULATED PLASTICS • WINDMILLS • WIPERS
WIRE & CABLE • SPARK PLUGS • METAL FABRICATOR ASSEMBLIES
SEAT BUCK CASTER • ZINC & ALUMINUM CASE OR CATHODE
WINDMILLS

Time in "Suspense" CBS Radio Mondays

CBS Television Tuesdays



DELTA WIND and tail of Gloster Javelin are shown graphically in this first published three-view of the plane.

maneuverability and a tremendous rate of climb. The low wing loading and thrust loading indicate that these general characteristics can be met.

Watson's impressive flight demonstration of the Javelin at Farnborough showed off the maneuverability of the craft. Although operating under a ten percent speed restriction to 400 knots, which meant no blistering flypasts—the Javelin impressed technical observers with an extremely small radius turn at over 100°. There was some evidence as the work went on that the selected speed was being interpreted somewhat loosely.

Chilling moment arrived at take-off of the Javelin. Immediately upon becoming airborne, Watson would work the big plane into a steep climb—turn to the left, and [as it seemed from a distance] just when the crowd with the left wing. Landing of the Javelin was also noteworthy because of the slow approach and landing speed and the low angle of incidence of touch down—estimated at only a few degrees above the static ground angle.

Building the Plane—Production of the Javelin will be mainly at Gloster's Harrogate factory in Gloucestershire. The factory is now turning out a variety of Mustang at the rate of about 90 per month for the RAF and the NATO countries, as well as some of the other nations integrated in being members of the anti-Communist bloc.

The Meteor is an elderly replica, powered by two Rolls-Royce Derwent engines, designed to fly at 100 mph. It was the only Allied jet



a better method for
casting
wider ranges of alloys



microcast®

NEW USES FOR NEW METALS... the development of new, high heat and corrosion resistant alloys in conjunction with the MICROCAST process opens new possibilities in the design of component parts. Extremely easily and difficult to fabricate by conventional methods, these lighter alloys may be readily MICROCAST to desired specifications with no

optimal recovery, treatment, and surface cleanliness.

After plating and drawing several parts for MICROCAST, the Product Development and Design Engineer has a much wider choice of alloy and grade freedom in design than when employing conventional fabricating methods. MICROCAST also permits greater savings because it eliminates considerable machining, produces efficient parts quickly and in mass quantities, and saves on expensive tooling projects.



Write for New Microcast Book

MICROCAST DIVISION
KUTLER LABORATORIES, INC.
250 East 96th St., New York 17, New York
115 East 4th Place, Chicago 27, Illinois



The A-C Control Panel includes an automatic voltage regulator, an exciter control relay, an exciter protection relay, and three differential current protection relays.



Aircraft alternator voltage regulator



Partially disassembled differential relay protection assembly



Circuit breaker (Cover Removed)



Exciter control relay (Cover Removed)



Exciter protection relay (Cover Removed)



Current transformer

Millions of Air-Borne Kilowatthours Protected by Westinghouse A-C Control

Westinghouse offers actual service-tested components for complete control and protection of a-c power systems. Exciter field relays, circuit breakers, differential relays, exciter protection relays and voltage regulators have accumulated millions of successful operating hours under flight conditions.

As individual units, or built into compact control panels, their design reflects years of engineering and operating experience.

The practical a-c system for aircraft was pioneered and developed by Westinghouse. The results of this

experience in products and services are available for your applications.

Our latest plug-in control panels, for example, offer space and weight savings, simplified airplane wiring and installation. They minimize ground time and reduce maintenance costs.

Go to the leader in aviation experience. For the best equipment and advice on a-c systems, call your nearest Westinghouse representative or write Westinghouse Electric Corporation, Aircraft Department, Lima, Ohio.

24299

YOU CAN BE SURE... IF IT'S
Westinghouse

LEADER IN
AVIATION EQUIPMENT



seven out of ten use



Aviation Products

● Outstanding leadership in aviation petroleum service does not just happen—it is the result of more than 45 years of aviation experience.

● 87 of the 92 narrow-body trans-atlantic flights—up to 1987—used gasoline supplied by an Esso refinery, and none of these flights failed.

● More recently, Esso Laboratories have and in Europe have pioneered the development of synthetic turbine lubricating oils, which currently are being supplied for the design testing

of engines of the newest and largest British and U. S. turbo jet engines. Esso turbo oils have superior low temperature characteristics and at the same time show remarkable fuel-saving ability at operating temperatures.

● Today, members of Esso Aviation Products—at hundreds of major airports along the seaways of the world—provide language machine operators and pilots with the most efficient ground service as well as anywhere high quality fuels and lubricants.



A good sign to fly to

"As Good As Gold" "World Economy of Flying" and International aviation trade press



SHADOW DRAFTER shows flow pattern around typical sonic model flying at 2,500 mph through test section of low-flight windtunnel. Light outlines of model back in boundary layer. Also shown are tip section streamlines from tail surfaces and turbulent wake behind base of model.



LAUNCHER fire models of missiles into supersonic gas to add velocities of bullet and wind for higher Mach numbers. Model of missile (right) evaluated in photo when it's ready for firing. Clear plastic pattern breaks away rapidly from missile after leaving nozzle of launcher, base of solid rocket and legs for behind model.



Windtunnel Is a Firing Range

The expensive, fire-fight windtunnel at NACA's Ames Aeronautical Laboratory, Moffett Field, Calif., is an old idea with a new twist.

● Old idea: Ballistics range in which a projectile is fired past a series of photographic stations. The resultant pictures, made at split-second intervals,

permit both qualitative and quantitative measurements of bullet performance.

● New twist: Firing range is a wind-tunnel, and the bullet is thrust into the teeth of a pole. The velocities of bullet and barrel add and produce far higher Mach numbers—currently up to

Mach 8—faster than with other device alone.

The gun barrels available vary in caliber from 0.22 in. to 1 in. Model number on aerodynamic shape are fired, using a subsonic compressed gas and slung made from plastic to shape the projectile and set the base of the launcher. The shot breaks away in pieces after leaving the muzzle of the gun.

High Reynolds' numbers are available with small models because of the high density of the air in the test section. For example, a 6-in. model tested at Mach 7 is the length of barrel, gives direct correspondence to a 10-ft. model at Mach 7 at 100,000 ft.

SAE Meeting Theme: Supersonic Flight

Los Angeles—Don Bennett, president of the Society of Automotive Engineers, convened up the task of the new data 1,350 engineers who gathered here for the organization's recent National Aeronautics Meeting with one simple phrase:

"Our problem is to make planes go a little faster and a little faster."

The program for the five-day meeting listed 11 national guest speakers and an equal number of day and night formal meetings on such varied topics as fueling economics, electromechanical control, electronics, plant engineering, engines, fueljet engines and more. But the real theme of the meeting could be summed up in two words: supersonic flight.

What, Don Bennett, was the emphasis at—supersonic?

"Whatever the topic," he replied, "it all comes back to this: We're trying to produce airplanes that lift the speed and altitude limits."

General Charles W. Wright, head of another answer for the same question: "We're exchanging information," he said.

An engineer said: "It's a good chance to find out what the competition is doing."

The competition obviously was here as the problems of supersonic flight actually, the very of solving them at once in greater proportion.

● Idea on Forming: The national Aircraft Production Forum, second as former, gave a good example of the multiplicity of solutions. Plans opening in business and engineering circles require heavier materials. These heavier materials mean greater stresses in forming, bringing such problems as this looking up. New materials are required and new techniques obviously are called for, but agreement reached there should material be formed is a soft

BONDED STOCK - SOURCE INSPECTED

AN and MS Tube Fittings
from **WEATHERHEAD**

A NEW EFFICIENT WAY TO BUY

Now you can buy Tube Fittings and Hose Ends from Weatherhead, source inspected to approved quality control standards, packaged, sealed and stacked under controlled BONDED conditions.

HERE'S WHAT YOU GET . . .

Under the Government Mill Run Bonded Stock Program, each package of Weatherhead parts you buy is designed to provide:

- * Clear Identification
- * Accurate Count
- * Maximum Protection
- * Approved Medium Packaging

Bonded Stock, Source-Inspected Weatherhead parts offer these buying advantages:

10 IMPORTANT BUYING ADVANTAGES

At No Extra Cost

1. Uniform High Quality
2. Simplified Paper Work
3. Sealed Government Source Inspection
4. Constant Specification Control
5. Proper Product Identification
6. Better Product Protection
7. Simplified Inventory Records
8. Reduced Inventory Losses
9. Faster Stock Room Service
10. Inspection Identification Always Available

Write for our Illustrated brochure A-599 Supplyment on Weatherhead Fittings and Hose Assemblies. Address: THE WEATHERHEAD COMPANY, Dept. E, 300 East 131st Street, Cleveland 8, Ohio.



AN
Flared Fittings



MS
Flareless Fittings



AN & MS
Hose End Fittings



First in Hydraulic Connections

condition and then kept heated, as heated and then heated. There was no solution—although the argument is self-evident. Proponents listed the advantages of hot forming: easier forming, more exact forming. Opponents objected to dimensional changes wrought by cooling.

Although plastics can be formed in extreme shapes they do not hold up on many uses and several exposures can bonded against tendencies to go overboard on this method.

Bosch declared that it is producing a workday plastic mold which plastic can be formed over a plastic mold which is then removed away rather than clamped and only a hammer at the risk of injury to the part.

► New Approaches—Two production techniques drew a great deal of interest.

► Lockhead's new sub-piercing method of connecting sheet metal pressure for blowing small shot through multiple holes into the sheet. No form is used but a drilled operator is required.

► North American's die-gauging process forms heated part, then liquidizes it to form temperature while still in the die. Spraying and wiping are then eliminated. A die pressure as high as 10,000 psi is used. No finish forming is required. North American reports

this is now an accepted production technique there, with more than 11,000 parts formed out in the market.

One production panel considered ways to reproduce design changes with maximum delay and minimum in production. American took up methods of quality control to reduce production cost and raise quality levels. Another panel covered plant layout.

Continues in general were similar and familiar. Old methods can't be suddenly discarded while new techniques still are in the experimental stage, whether a new technique can replace an old one depends on the available cost, new techniques solve new problems.

But one conclusion was obvious: A tremendous manufacturing expansion is underway as the new supermachines.

Some papers at the formal meetings were presented by storage loss with new ideas; others were delivered by flexible face plugging away at familiar themes—such as Corbin's Extra Steel and his "Highspeed Water-Bored Air Craft."

The reason for all this emphasis on supermachines fight me off two clear from the leading topic at the latest closed confidential session Thursday night, "Secret Air Weapons."

—WJC



A BIG FRENCH JET

The French Air Force's latest jet engine, which is used at 6,100 lb thrust, usually at 9,100 lb, with afterburners. Top view shows the turbojet mounted ship's French Air Force SE-161 Langsdorf for

flight testing, lower view is a closeup of the engine's exhaust. The SE-161 has seven compressor stages, 1 turbine stage. It is 112 in. long, 14.9 in. in diameter and weighs 1,150 lb dry.



Iron-Constantan
Copper-Constantan
Chromel-Alumel

FOR MEASURING
TEMPERATURES IN AIRCRAFT



AN-300-1 10 MM Iron-Constantan Spigot-type probe type thermocouple for measuring cylinder head temperatures. Also available in copper-constantan and in 16 MM size for other material.

AN-300-2 Iron-Constantan Spigot-type probe type with copper ring for 16 MM plugs. Wire guard and supporting bracket are stainless steel and conductors are protected with flexible heat-resistant sheathing. AN-300-3 normally are silver-soldered to leads.

AN-300-4 Iron-Constantan Spigot-type thermocouple with junction located in silver tip. Spring used with this thermocouple will retain its strength despite high temperatures.

AN-300-5 Chromel-Alumel Thermocouple. Insulated with a temperature-resistant ceramic and overcoated with stainless steel wire, this thermocouple is built to withstand severe jet engine service. Its active length can vary to meet temperature measurement problems.

**THE LEWIS
ENGINEERING CO.**
Manufacturers of Complete Temperature
Measuring Systems for Aircraft
NAVATRON, CONNECTICUT

DURANICKEL

may easily provide the
spring properties
you need in a
corrosion-resisting alloy!

You might look a long time before finding another alloy with all the advantages of Duranickel.

A wrought alloy, Duranickel is age-hardenable, or capable of having its hardness and strength increased by thermal treatment—and has the dependable corrosion resistance of Nickel.

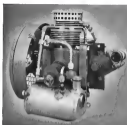
And that's only the beginning! You can figure for yourself just how valuable Duranickel could be for a spring application of yours when you consider its other principal characteristics:

- uniform spring properties at temperatures up to 400° F.
- high fatigue strength and endurance limit for non-fluctuating, corrosion-resisting materials
- ready weldability

As a typical example of Duranickel's usefulness, let's examine briefly the new Kiddie 4-stage compressor shown above.

Developed for pneumatically-operated airborne equipment, this lightweight compressor has neither connecting rods, wrist pins nor other complications required by conventional designs. Instead, a master-shaft-riding cam simply pushes the pistons into their cylinders. A wrist yoke and sliding rod reverses the first piston while compressed air from preceding stages retracts the others.

For the first valve in the first stage which is intricately shaped and then heat treated, the design engineers of Walker Kiddie & Company, Inc., specified age-hardenable Duranickel. They also called for Duranickel for valve seat rings.



NEW KIDDE 4-stage compressor delivers volume of high altitudes. Its 22,000 (psi) then 4-Stage, 4-piston air compressor delivers (from ambient pressure) one cfm of free air compressed to 2,000 psi. Its one-half delivery of 4 cfm of free air compressed to 2,000 psi can be maintained at high altitudes when 100% air is compressed. The compressor weighs only 12 pounds, has 16-ounce valve of Duranickel, and 16-ounce wrist yoke springs to insure sliding of intake valves. Photo courtesy of Walker Kiddie & Company, Inc., Redlands, N. J.

Duranickel is well able to withstand the high temperatures encountered in meeting the severe requirement. It is not affected by moisture squeezed out of the air during compression. And it offers high strength to prevent warpage.

Put Duranickel down in your book for workability, too. It can be hot-worked, forged and cold-worked.

It is most readily machined in the annealed condition, and is commercially machineable in other conditions at hardnesses up to 275 HRC.

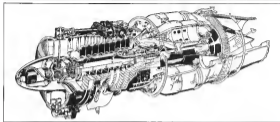
Duranickel can be joined by commonly-used welding, brazing and soft soldering processes.

You'll find detailed engineering data on Duranickel (and its companion alloys, Duranickel "W" and Permnickel®) in Technical Bulletin T-53, "Engineering Properties of Duranickel." A copy is ready and waiting for you. Write us for it.

Meanwhile, keep Duranickel in mind for any applications where corrosion resistance, high hardness and great strength are needed in high stress applications. Remember, though, that Duranickel, like other nickel alloys, is a user on extended delivery because of defense requirements. So it is important to include NIA rating and complete end-use information when you place orders.

THE INTERNATIONAL NICKEL COMPANY, INC.
47 Wall Street, New York 6, N. Y.

MONROE: "1" MONROE: "2" MONROE: "3" MONROE: "4" MONROE: "5" MONROE: "6" MONROE: "7" MONROE: "8" MONROE: "9" MONROE: "10" MONROE: "11" MONROE: "12" MONROE: "13" MONROE: "14" MONROE: "15" MONROE: "16" MONROE: "17" MONROE: "18" MONROE: "19" MONROE: "20" MONROE: "21" MONROE: "22" MONROE: "23" MONROE: "24" MONROE: "25" MONROE: "26" MONROE: "27" MONROE: "28" MONROE: "29" MONROE: "30" MONROE: "31" MONROE: "32" MONROE: "33" MONROE: "34" MONROE: "35" MONROE: "36" MONROE: "37" MONROE: "38" MONROE: "39" MONROE: "40" MONROE: "41" MONROE: "42" MONROE: "43" MONROE: "44" MONROE: "45" MONROE: "46" MONROE: "47" MONROE: "48" MONROE: "49" MONROE: "50" MONROE: "51" MONROE: "52" MONROE: "53" MONROE: "54" MONROE: "55" MONROE: "56" MONROE: "57" MONROE: "58" MONROE: "59" MONROE: "60" MONROE: "61" MONROE: "62" MONROE: "63" MONROE: "64" MONROE: "65" MONROE: "66" MONROE: "67" MONROE: "68" MONROE: "69" MONROE: "70" MONROE: "71" MONROE: "72" MONROE: "73" MONROE: "74" MONROE: "75" MONROE: "76" MONROE: "77" MONROE: "78" MONROE: "79" MONROE: "80" MONROE: "81" MONROE: "82" MONROE: "83" MONROE: "84" MONROE: "85" MONROE: "86" MONROE: "87" MONROE: "88" MONROE: "89" MONROE: "90" MONROE: "91" MONROE: "92" MONROE: "93" MONROE: "94" MONROE: "95" MONROE: "96" MONROE: "97" MONROE: "98" MONROE: "99" MONROE: "100" MONROE: "101" MONROE: "102" MONROE: "103" MONROE: "104" MONROE: "105" MONROE: "106" MONROE: "107" MONROE: "108" MONROE: "109" MONROE: "110" MONROE: "111" MONROE: "112" MONROE: "113" MONROE: "114" MONROE: "115" MONROE: "116" MONROE: "117" MONROE: "118" MONROE: "119" MONROE: "120" MONROE: "121" MONROE: "122" MONROE: "123" MONROE: "124" MONROE: "125" MONROE: "126" MONROE: "127" MONROE: "128" MONROE: "129" MONROE: "130" MONROE: "131" MONROE: "132" MONROE: "133" MONROE: "134" MONROE: "135" MONROE: "136" MONROE: "137" MONROE: "138" MONROE: "139" MONROE: "140" MONROE: "141" MONROE: "142" MONROE: "143" MONROE: "144" MONROE: "145" MONROE: "146" MONROE: "147" MONROE: "148" MONROE: "149" MONROE: "150" MONROE: "151" MONROE: "152" MONROE: "153" MONROE: "154" MONROE: "155" MONROE: "156" MONROE: "157" MONROE: "158" MONROE: "159" MONROE: "160" MONROE: "161" MONROE: "162" MONROE: "163" MONROE: "164" MONROE: "165" MONROE: "166" MONROE: "167" MONROE: "168" MONROE: "169" MONROE: "170" MONROE: "171" MONROE: "172" MONROE: "173" MONROE: "174" MONROE: "175" MONROE: "176" MONROE: "177" MONROE: "178" MONROE: "179" MONROE: "180" MONROE: "181" MONROE: "182" MONROE: "183" MONROE: "184" MONROE: "185" MONROE: "186" MONROE: "187" MONROE: "188" MONROE: "189" MONROE: "190" MONROE: "191" MONROE: "192" MONROE: "193" MONROE: "194" MONROE: "195" MONROE: "196" MONROE: "197" MONROE: "198" MONROE: "199" MONROE: "200" MONROE: "201" MONROE: "202" MONROE: "203" MONROE: "204" MONROE: "205" MONROE: "206" MONROE: "207" MONROE: "208" MONROE: "209" MONROE: "210" MONROE: "211" MONROE: "212" MONROE: "213" MONROE: "214" MONROE: "215" MONROE: "216" MONROE: "217" MONROE: "218" MONROE: "219" MONROE: "220" MONROE: "221" MONROE: "222" MONROE: "223" MONROE: "224" MONROE: "225" MONROE: "226" MONROE: "227" MONROE: "228" MONROE: "229" MONROE: "230" MONROE: "231" MONROE: "232" MONROE: "233" MONROE: "234" MONROE: "235" MONROE: "236" MONROE: "237" MONROE: "238" MONROE: "239" MONROE: "240" MONROE: "241" MONROE: "242" MONROE: "243" MONROE: "244" MONROE: "245" MONROE: "246" MONROE: "247" MONROE: "248" MONROE: "249" MONROE: "250" MONROE: "251" MONROE: "252" MONROE: "253" MONROE: "254" MONROE: "255" MONROE: "256" MONROE: "257" MONROE: "258" MONROE: "259" MONROE: "260" MONROE: "261" MONROE: "262" MONROE: "263" MONROE: "264" MONROE: "265" MONROE: "266" MONROE: "267" MONROE: "268" MONROE: "269" MONROE: "270" MONROE: "271" MONROE: "272" MONROE: "273" MONROE: "274" MONROE: "275" MONROE: "276" MONROE: "277" MONROE: "278" MONROE: "279" MONROE: "280" MONROE: "281" MONROE: "282" MONROE: "283" MONROE: "284" MONROE: "285" MONROE: "286" MONROE: "287" MONROE: "288" MONROE: "289" MONROE: "290" MONROE: "291" MONROE: "292" MONROE: "293" MONROE: "294" MONROE: "295" MONROE: "296" MONROE: "297" MONROE: "298" MONROE: "299" MONROE: "300" MONROE: "301" MONROE: "302" MONROE: "303" MONROE: "304" MONROE: "305" MONROE: "306" MONROE: "307" MONROE: "308" MONROE: "309" MONROE: "310" MONROE: "311" MONROE: "312" MONROE: "313" MONROE: "314" MONROE: "315" MONROE: "316" MONROE: "317" MONROE: "318" MONROE: "319" MONROE: "320" MONROE: "321" MONROE: "322" MONROE: "323" MONROE: "324" MONROE: "325" MONROE: "326" MONROE: "327" MONROE: "328" MONROE: "329" MONROE: "330" MONROE: "331" MONROE: "332" MONROE: "333" MONROE: "334" MONROE: "335" MONROE: "336" MONROE: "337" MONROE: "338" MONROE: "339" MONROE: "340" MONROE: "341" MONROE: "342" MONROE: "343" MONROE: "344" MONROE: "345" MONROE: "346" MONROE: "347" MONROE: "348" MONROE: "349" MONROE: "350" MONROE: "351" MONROE: "352" MONROE: "353" MONROE: "354" MONROE: "355" MONROE: "356" MONROE: "357" MONROE: "358" MONROE: "359" MONROE: "360" MONROE: "361" MONROE: "362" MONROE: "363" MONROE: "364" MONROE: "365" MONROE: "366" MONROE: "367" MONROE: "368" MONROE: "369" MONROE: "370" MONROE: "371" MONROE: "372" MONROE: "373" MONROE: "374" MONROE: "375" MONROE: "376" MONROE: "377" MONROE: "378" MONROE: "379" MONROE: "380" MONROE: "381" MONROE: "382" MONROE: "383" MONROE: "384" MONROE: "385" MONROE: "386" MONROE: "387" MONROE: "388" MONROE: "389" MONROE: "390" MONROE: "391" MONROE: "392" MONROE: "393" MONROE: "394" MONROE: "395" MONROE: "396" MONROE: "397" MONROE: "398" MONROE: "399" MONROE: "400" MONROE: "401" MONROE: "402" MONROE: "403" MONROE: "404" MONROE: "405" MONROE: "406" MONROE: "407" MONROE: "408" MONROE: "409" MONROE: "410" MONROE: "411" MONROE: "412" MONROE: "413" MONROE: "414" MONROE: "415" MONROE: "416" MONROE: "417" MONROE: "418" MONROE: "419" MONROE: "420" MONROE: "421" MONROE: "422" MONROE: "423" MONROE: "424" MONROE: "425" MONROE: "426" MONROE: "427" MONROE: "428" MONROE: "429" MONROE: "430" MONROE: "431" MONROE: "432" MONROE: "433" MONROE: "434" MONROE: "435" MONROE: "436" MONROE: "437" MONROE: "438" MONROE: "439" MONROE: "440" MONROE: "441" MONROE: "442" MONROE: "443" MONROE: "444" MONROE: "445" MONROE: "446" MONROE: "447" MONROE: "448" MONROE: "449" MONROE: "450" MONROE: "451" MONROE: "452" MONROE: "453" MONROE: "454" MONROE: "455" MONROE: "456" MONROE: "457" MONROE: "458" MONROE: "459" MONROE: "460" MONROE: "461" MONROE: "462" MONROE: "463" MONROE: "464" MONROE: "465" MONROE: "466" MONROE: "467" MONROE: "468" MONROE: "469" MONROE: "470" MONROE: "471" MONROE: "472" MONROE: "473" MONROE: "474" MONROE: "475" MONROE: "476" MONROE: "477" MONROE: "478" MONROE: "479" MONROE: "480" MONROE: "481" MONROE: "482" MONROE: "483" MONROE: "484" MONROE: "485" MONROE: "486" MONROE: "487" MONROE: "488" MONROE: "489" MONROE: "490" MONROE: "491" MONROE: "492" MONROE: "493" MONROE: "494" MONROE: "495" MONROE: "496" MONROE: "497" MONROE: "498" MONROE: "499" MONROE: "500" MONROE: "501" MONROE: "502" MONROE: "503" MONROE: "504" MONROE: "505" MONROE: "506" MONROE: "507" MONROE: "508" MONROE: "509" MONROE: "510" MONROE: "511" MONROE: "512" MONROE: "513" MONROE: "514" MONROE: "515" MONROE: "516" MONROE: "517" MONROE: "518" MONROE: "519" MONROE: "520" MONROE: "521" MONROE: "522" MONROE: "523" MONROE: "524" MONROE: "525" MONROE: "526" MONROE: "527" MONROE: "528" MONROE: "529" MONROE: "530" MONROE: "531" MONROE: "532" MONROE: "533" MONROE: "534" MONROE: "535" MONROE: "536" MONROE: "537" MONROE: "538" MONROE: "539" MONROE: "540" MONROE: "541" MONROE: "542" MONROE: "543" MONROE: "544" MONROE: "545" MONROE: "546" MONROE: "547" MONROE: "548" MONROE: "549" MONROE: "550" MONROE: "551" MONROE: "552" MONROE: "553" MONROE: "554" MONROE: "555" MONROE: "556" MONROE: "557" MONROE: "558" MONROE: "559" MONROE: "560" MONROE: "561" MONROE: "562" MONROE: "563" MONROE: "564" MONROE: "565" MONROE: "566" MONROE: "567" MONROE: "568" MONROE: "569" MONROE: "570" MONROE: "571" MONROE: "572" MONROE: "573" MONROE: "574" MONROE: "575" MONROE: "576" MONROE: "577" MONROE: "578" MONROE: "579" MONROE: "580" MONROE: "581" MONROE: "582" MONROE: "583" MONROE: "584" MONROE: "585" MONROE: "586" MONROE: "587" MONROE: "588" MONROE: "589" MONROE: "590" MONROE: "591" MONROE: "592" MONROE: "593" MONROE: "594" MONROE: "595" MONROE: "596" MONROE: "597" MONROE: "598" MONROE: "599" MONROE: "600" MONROE: "601" MONROE: "602" MONROE: "603" MONROE: "604" MONROE: "605" MONROE: "606" MONROE: "607" MONROE: "608" MONROE: "609" MONROE: "610" MONROE: "611" MONROE: "612" MONROE: "613" MONROE: "614" MONROE: "615" MONROE: "616" MONROE: "617" MONROE: "618" MONROE: "619" MONROE: "620" MONROE: "621" MONROE: "622" MONROE: "623" MONROE: "624" MONROE: "625" MONROE: "626" MONROE: "627" MONROE: "628" MONROE: "629" MONROE: "630" MONROE: "631" MONROE: "632" MONROE: "633" MONROE: "634" MONROE: "635" MONROE: "636" MONROE: "637" MONROE: "638" MONROE: "639" MONROE: "640" MONROE: "641" MONROE: "642" MONROE: "643" MONROE: "644" MONROE: "645" MONROE: "646" MONROE: "647" MONROE: "648" MONROE: "649" MONROE: "650" MONROE: "651" MONROE: "652" MONROE: "653" MONROE: "654" MONROE: "655" MONROE: "656" MONROE: "657" MONROE: "658" MONROE: "659" MONROE: "660" MONROE: "661" MONROE: "662" MONROE: "663" MONROE: "664" MONROE: "665" MONROE: "666" MONROE: "667" MONROE: "668" MONROE: "669" MONROE: "670" MONROE: "671" MONROE: "672" MONROE: "673" MONROE: "674" MONROE: "675" MONROE: "676" MONROE: "677" MONROE: "678" MONROE: "679" MONROE: "680" MONROE: "681" MONROE: "682" MONROE: "683" MONROE: "684" MONROE: "685" MONROE: "686" MONROE: "687" MONROE: "688" MONROE: "689" MONROE: "690" MONROE: "691" MONROE: "692" MONROE: "693" MONROE: "694" MONROE: "695" MONROE: "696" MONROE: "697" MONROE: "698" MONROE: "699" MONROE: "700" MONROE: "701" MONROE: "702" MONROE: "703" MONROE: "704" MONROE: "705" MONROE: "706" MONROE: "707" MONROE: "708" MONROE: "709" MONROE: "710" MONROE: "711" MONROE: "712" MONROE: "713" MONROE: "714" MONROE: "715" MONROE: "716" MONROE: "717" MONROE: "718" MONROE: "719" MONROE: "720" MONROE: "721" MONROE: "722" MONROE: "723" MONROE: "724" MONROE: "725" MONROE: "726" MONROE: "727" MONROE: "728" MONROE: "729" MONROE: "730" MONROE: "731" MONROE: "732" MONROE: "733" MONROE: "734" MONROE: "735" MONROE: "736" MONROE: "737" MONROE: "738" MONROE: "739" MONROE: "740" MONROE: "741" MONROE: "742" MONROE: "743" MONROE: "744" MONROE: "745" MONROE: "746" MONROE: "747" MONROE: "748" MONROE: "749" MONROE: "750" MONROE: "751" MONROE: "752" MONROE: "753" MONROE: "754" MONROE: "755" MONROE: "756" MONROE: "757" MONROE: "758" MONROE: "759" MONROE: "760" MONROE: "761" MONROE: "762" MONROE: "763" MONROE: "764" MONROE: "765" MONROE: "766" MONROE: "767" MONROE: "768" MONROE: "769" MONROE: "770" MONROE: "771" MONROE: "772" MONROE: "773" MONROE: "774" MONROE: "775" MONROE: "776" MONROE: "777" MONROE: "778" MONROE: "779" MONROE: "780" MONROE: "781" MONROE: "782" MONROE: "783" MONROE: "784" MONROE: "785" MONROE: "786" MONROE: "787" MONROE: "788" MONROE: "789" MONROE: "790" MONROE: "791" MONROE: "792" MONROE: "793" MONROE: "794" MONROE: "795" MONROE: "796" MONROE: "797" MONROE: "798" MONROE: "799" MONROE: "800" MONROE: "801" MONROE: "802" MONROE: "803" MONROE: "804" MONROE: "805" MONROE: "806" MONROE: "807" MONROE: "808" MONROE: "809" MONROE: "810" MONROE: "811" MONROE: "812" MONROE: "813" MONROE: "814" MONROE: "815" MONROE: "816" MONROE: "817" MONROE: "818" MONROE: "819" MONROE: "820" MONROE: "821" MONROE: "822" MONROE: "823" MONROE: "824" MONROE: "825" MONROE: "826" MONROE: "827" MONROE: "828" MONROE: "829" MONROE: "830" MONROE: "831" MONROE: "832" MONROE: "833" MONROE: "834" MONROE: "835" MONROE: "836" MONROE: "837" MONROE: "838" MONROE: "839" MONROE: "840" MONROE: "841" MONROE: "842" MONROE: "843" MONROE: "844" MONROE: "845" MONROE: "846" MONROE: "847" MONROE: "848" MONROE: "849" MONROE: "850" MONROE: "851" MONROE: "852" MONROE: "853" MONROE: "854" MONROE: "855" MONROE: "856" MONROE: "857" MONROE: "858" MONROE: "859" MONROE: "860" MONROE: "861" MONROE: "862" MONROE: "863" MONROE: "864" MONROE: "865" MONROE: "866" MONROE: "867" MONROE: "868" MONROE: "869" MONROE: "870" MONROE: "871" MONROE: "872" MONROE: "873" MONROE: "874" MONROE: "875" MONROE: "876" MONROE: "877" MONROE: "878" MONROE: "879" MONROE: "880" MONROE: "881" MONROE: "882" MONROE: "883" MONROE: "884" MONROE: "885" MONROE: "886" MONROE: "887" MONROE: "888" MONROE: "889" MONROE: "890" MONROE: "891" MONROE: "892" MONROE: "893" MONROE: "894" MONROE: "895" MONROE: "896" MONROE: "897" MONROE: "898" MONROE: "899" MONROE: "900" MONROE: "901" MONROE: "902" MONROE: "903" MONROE: "904" MONROE: "905" MONROE: "906" MONROE: "907" MONROE: "908" MONROE: "909" MONROE: "910" MONROE: "911" MONROE: "912" MONROE: "913" MONROE: "914" MONROE: "915" MONROE: "916" MONROE: "917" MONROE: "918" MONROE: "919" MONROE: "920" MONROE: "921" MONROE: "922" MONROE: "923" MONROE: "924" MONROE: "925" MONROE: "926" MONROE: "927" MONROE: "928" MONROE: "929" MONROE: "930" MONROE: "931" MONROE: "932" MONROE: "933" MONROE: "934" MONROE: "935" MONROE: "936" MONROE: "937" MONROE: "938" MONROE: "939" MONROE: "940" MONROE: "941" MONROE: "942" MONROE: "943" MONROE: "944" MONROE: "945" MONROE: "946" MONROE: "947" MONROE: "948" MONROE: "949" MONROE: "950" MONROE: "951" MONROE: "952" MONROE: "953" MONROE: "954" MONROE: "955" MONROE: "956" MONROE: "957" MONROE: "958" MONROE: "959" MONROE: "960" MONROE: "961" MONROE: "962" MONROE: "963" MONROE: "964" MONROE: "965" MONROE: "966" MONROE: "967" MONROE: "968" MONROE: "969" MONROE: "970" MONROE: "971" MONROE: "972" MONROE: "973" MONROE: "974" MONROE: "975" MONROE: "976" MONROE: "977" MONROE: "978" MONROE: "979" MONROE: "980" MONROE: "981" MONROE: "982" MONROE: "983" MONROE: "984" MONROE: "985" MONROE: "986" MONROE: "987" MONROE: "988" MONROE: "989" MONROE: "990" MONROE: "991" MONROE: "992" MONROE: "993" MONROE: "994" MONROE: "995" MONROE: "996" MONROE: "997" MONROE: "998" MONROE: "999" MONROE: "1000" MONROE: "1001" MONROE: "1002" MONROE: "1003" MONROE: "1004" MONROE: "1005" MONROE: "1006" MONROE: "1007" MONROE: "1008" MONROE: "1009" MONROE: "1010" MONROE: "1011" MONROE: "1012" MONROE: "1013" MONROE: "1014" MONROE: "1015" MONROE: "1016" MONROE: "1017" MONROE: "1018" MONROE: "1019" MONROE: "1020" MONROE: "1021" MONROE: "1022" MONROE: "1023" MONROE: "1024" MONROE: "1025" MONROE: "1026" MONROE: "1027" MONROE: "1028" MONROE: "1029" MONROE: "1030" MONROE: "1031" MONROE: "1032" MONROE: "1033" MONROE: "1034" MONROE: "1035" MONROE: "1036" MONROE: "1037" MONROE: "1038" MONROE: "1039" MONROE: "1040" MONROE: "1041" MONROE: "1042" MONROE: "1043" MONROE: "1044" MONROE: "1045" MONROE: "1046" MONROE: "1047" MONROE: "1048" MONROE: "1049" MONROE: "1050" MONROE: "1051" MONROE: "1052" MONROE: "1053" MONROE: "1054" MONROE: "1055" MONROE: "1056" MONROE: "1057" MONROE: "1058" MONROE: "1059" MONROE: "1060" MONROE: "1061" MONROE: "1062" MONROE: "1063" MONROE: "1064" MONROE: "1065" MONROE: "1066" MONROE: "1067" MONROE: "1068" MONROE: "1069" MONROE: "1070" MONROE: "1071" MONROE: "1072" MONROE: "1073" MONROE: "1074" MONROE: "1075" MONROE: "1076" MONROE: "1077" MONROE: "1078" MONROE: "1079" MONROE: "1080" MONROE: "1081" MONROE: "1082" MONROE: "1083" MONROE: "1084" MONROE: "1085" MONROE: "1086" MONROE: "1087" MONROE: "1088" MONROE: "1089" MONROE: "1090" MONROE: "1091" MONROE: "1092" MONROE: "1093" MONROE: "1094" MONROE: "1095" MONROE: "1096" MONROE: "1097" MONROE: "1098" MONROE: "1099" MONROE: "1100" MONROE: "1101" MONROE: "1102" MONROE: "1103" MONROE: "1104" MONROE: "1105" MONROE: "1106" MONROE: "1107" MONROE: "1108" MONROE: "1109" MONROE: "1110" MONROE: "1111" MONROE: "1112" MONROE: "1113" MONROE: "1114" MONROE: "1115" MONROE: "1116" MONROE: "1117" MONROE: "1118" MONROE: "1119" MONROE: "1120" MONROE: "1121" MONROE: "1122" MONROE: "1123" MONROE: "1124" MONROE: "1125" MONROE: "1126" MONROE: "1127" MONROE: "1128" MONROE: "1129" MONROE: "1130" MONROE: "1131" MONROE: "1132" MONROE: "1133" MONROE: "1134" MONROE: "1135" MONROE: "1136" MONROE: "1137" MONROE: "1138" MONROE: "1139" MONROE: "1140" MONROE: "1141" MONROE: "1142" MONROE: "1143" MONROE: "1144" MONROE: "1145" MONROE: "1146" MONROE: "1147" MONROE: "1148" MONROE: "1149" MONROE: "1150" MONROE: "1151" MONROE: "1152" MONROE: "1153" MONROE: "1154" MONROE: "1155" MONROE: "1156" MONROE: "1157" MONROE: "1158" MONROE: "1159" MONROE: "1160" MONROE: "1161" MONROE: "1162" MONROE: "1163" MONROE: "1164" MONROE: "1165" MONROE: "1166" MONROE: "1167" MONROE: "1168" MONROE: "1169" MONROE: "1170" MONROE: "1171" MONROE: "1172" MONROE: "1173" MONROE: "1174" MONROE: "1175" MONROE: "1176" MONROE: "1177" MONROE: "1178" MONROE: "1179" MONROE: "1180" MONROE: "1181" MONROE: "1182" MONROE: "1183" MONROE: "1184" MONROE: "1185" MONROE: "1186" MONROE: "1187" MONROE: "1188" MONROE: "1189" MONROE: "1190" MONROE: "1191" MONROE: "1192" MONROE: "1193" MONROE: "1194" MONROE: "1195" MONROE: "1196" MONROE: "1197" MONROE: "1198" MONROE: "1199" MONROE: "1200" MONROE: "1201" MONROE: "1202" MONROE: "1203" MONROE: "



FIRST DETAILED ORENDA CUTAWAY shows 16 compressor rings, large combustion area and its single exhaust valve!

Canada Aviation Expands to Make Orenda

- A. V. Roe opens plant for CF-100 engines.
- Peak production scheduled for end of 1953.

Canada's first engine factory to mass-produce turboprops recently opened at A. V. Roe Canada Ltd., Milton, Ont. The new, windowless 700,000 sq. ft. plant facility for building the company's Orenda was completed in little more than a year. During this time all the necessary manufacturing accessories were procured and installed.

Before the plant was opened, planned output was scheduled on government assistance, without changing target dates. Peak production is scheduled for the end of 1953.

► **Two-Two-Fighters**—The Orenda will power the Aero designed CF-100 Canada's first engine. It is a twin-engine, produced in a facility adjoining the engine plant. Orenda will also be required for F86 Sabres being made by Canadair Ltd. at Montreal, under license from North American Aviation. Part of these Canadair-built Sabres powered with Aero's Orenda was test-flown tested the end of September.

► **Wide Effect**—More than 400 suppliers are producing 70% of the parts needed to make the Orenda. Many of these 400 facilities are new ventures in Canada—set up in the last two years by American and British companies.

Establishment of the new Orenda



ORENDA POWERPLANT will be mass-produced at Aero's new Milton plant. It will drive Canadair-built F86 (foreground) and Aero CF-100 fighter (background). Total of Canada has been reported as slightly over 7,000 ft.

plant has attracted production and manufacturing skills needed in Canada's aviation industry. From the U.S. and Great Britain have come design specialists and skilled workmen who are training Canadians.

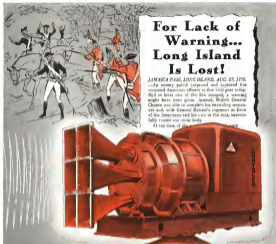
New facilities have been set up for the manufacture of high-temperature alloys and the processing of special high-strength and aluminum forgings for jet blades. New manufacturing plants have been built for making special gearbox assemblies, long-life ball and roller bearings, and for machining and heat treating large-diameter forgings and other fabricated components for jets. There are but a few of the related factors

which will have a permanent effect on the Canadian aviation industry.

► **Plant Details**—The mass production building at the Orenda plant covers 462,000 sq. ft., including increasing docks and offices. There are eight self-contained units, each about 50,000 sq. ft. in size. Everything is on one floor except workbenches and servicing equipment, which are elevated to save space for the installation of machinery.

The space-plan building permits production lines to be run in either direction. There is 32-ft. headroom throughout the plant. The steel structure is capable of taking 5-ton cranes.

Windows are eliminated, except in



For Lack of Warning... Long Island Is Lost!

JAMAICA PASS, LONG ISLAND, AUG. 25, 1776.

—An enemy patrol captured and captured him mounted American officers in this vital pass today. Not at least one of the three captured, a warning might have been given. Instead, British General Clinton was able to complete his marching maneuver and, with General Clinton's regiment in front of the Americans and his own at the rear, successfully routed our main body.

At the time of this battle, 1776.

CHRYSLER AIR RAID SIREN

can warn a circular area 8 miles in diameter

As a result of their victory at Long Island in 1776, the British were able later to take New York and begin other successful campaigns along the Atlantic seaboard.

All history is filled with military disasters to armies and peoples, which could have been prevented, had adequate warning been given of the impending attack.

Today, a system of Chrysler Air Raid Sirens, remote-controlled by automatic attention circuits, can warn an entire city in a matter of seconds. Thanks to the unusual power characteristics of its mighty 180-horsepower industrial V-8 engine, each Chrysler Siren can send a sharp, vibrant warning four miles in every direction. No other siren available today can match such performance. Civil Defense officials in many cities have discovered that the tremendous power of the Chrysler Siren means fewer units for complete coverage.

Each Chrysler Siren has its own self-contained power plant and is designed for operation by remote control or

manually, should the situation require it. This means, too, that Chrysler Sirens can be used on existing trade or boats for added safety or convenience.

Your own comparison will prove the greater economy, efficiency and practical advantages of a warning system employing Chrysler-engineered Sirens. For specifications and information on what protection your community requires, write: Chrysler Service, Wholes and Industrial Engine Division, Chrysler Corporation, Warren, Michigan.



Defense is a vital need, shared by all. Join and assist the Civil Defense group in your area.

CHRYSLER
AIR RAID SIREN

Standard-Thomson

Shut-off Valves



For fuel and hydraulic systems, Standard-Thomson Shut-Off Valves give these major advantages:

1. Standard-Thomson combines the proven sealing power of soft, synthetic rubber with a unique wear-tearing device. During the valve cycle, the seals are automatically re-mated. The moving part does not wear or bore on the seals.

2. For positive positioning of the gate, the seat embodies a mechanical camming which overcomes the resistance in full-open or full-closed position.

3. Use of a *zero-friction*, planetary gear assembly makes possible important savings in the design and cost of switching mechanism and motor.

Standard-Thomson Shut-Off Valves are furnished in diameters of 1" to 12", installed in a manually operated 2" to 12" body design can be adapted to shut-off service for any medium. For details, write: STANDARD-THOMSON CORPORATION • KATON 1, OHIO

Standard-Thomson

Makers of USAF-approved ballast • valves • lights



Controllable Pressuring Valve



Removable Pressure Valve



Tack-Fast Flexible Coupling



Vaportight Cap-Lamp

heating, and the roof is decked with precast concrete panels plus cast and trenched roof members. The plant will be kept at a constant 75-deg temperature all year.

Just both inside and outside the plant is carefully controlled by heating the floor, and landscaping and paving all approaches to the plant. Weather-protected passages and ventilators have electro-automatically operating doors for cleanliness and to keep heat losses down during Canada's cold winter.

There are six engine test cells built of steel and heavy concrete. The installation covers 24,000 sq. ft. and is soundproofed to the outside with insulate and exhaust silencing equipment. Hooked to the test cells is storage space for 475,000 gal. of engine test fuel.

Service buildings cover 70,000 sq. ft. A new overhead extension already under construction covers 53,000 sq. ft. Storage and shipping quarters occupy another 63,000 sq. ft.

Engine-makers the main plant each conducting line has a battery of floor-supported jigs cranes. These can lift, maneuver and place a component into its fixture and move it from one machine to the next where another crew takes over.

The standard units, whose inspection instruments are regularly checked, but its own air conditioning and control equipment to maintain a constant 68 deg and 45% humidity.

Production heat-treat and process department is also completely self-contained, is able to do cleaning and chrome and anodizing. And there is a heat-treat laboratory where a hot piece from each batch of parts goes through the heat production line is tested.

All major components are handled on a straight-line production system. In inspection operations are carried out in part of production so that at the end of the line each article has been passed out as satisfactory. Production lines for concrete in one particular part for perhaps a week, then switch over to production of a slightly different part, after which they return to making the original.

The plant is lighted with 3 mi. of fluorescent lighting, giving between 34 and 46 foot-candles of light at the working level.

A dual-operated emergency standby generator big enough to supply sufficient lighting for the plant even in when there is a sudden drop in the main voltage supply.

Production of the Canada is directed by Thomas S. McCone, general manager of Avco's Gas Turbine Division. McCone comes from the United States and was formerly with General Motors' Allison Division, where he was assistant director of engineering.



METALBONDING SPECIALISTS at Lockheed demonstrate the technique which gives increased strength and simplifies production. Costs are reduced at 30% less.

Metalbond Wing for Super Connie

Lockheed Aircraft Corp. is setting up a production department for use of metalbonding to assemble the assembly structure of the main fuselage and the wing for the Super Connie.

For the past year and a half Lockheed has made extensive tests of many structural adhesives for the physical properties and required structural designs for metalbonding applications. It has made extensive physical tests using production-type hardware for surface preparation and metalbonding assembly. Test panels from these tests have been pre-tested for required loads.

Metallbond Advantages — Utilized properly, a metalbonding assembly offers these advantages over riveted and spot-welded units, Lockheed production methods engineer S. W. Colson reports.

• Optimum outer skin smoothness.

• No stress concentration points on bonded areas.

• Cost savings up to 30% through simplified assembly techniques when production quantities are sufficient to justify tooling expense.

• Dissimilar metals can be joined, where plastic action normally would take place.

• Non-weldable metals may be used locally or pressure-tight parts.

• Greater rigidity of this skin for light structure designs, because "creeping" does not occur in assembly.

• Weight savings in some instances up to 15%—through more efficient use of material, reduction of fasteners, elimination of wrinkles, etc.

• Higher total strength.

First runs of metalbond assemblies, compared with production rivet methods, indicate greater production output per square foot of faster floor space. Colson says. Increased strength in production also can mean with new methods to reduce curing cycle time.

Insulation for a Scorpion!



Thickened Superinsulation is used on the USS Avond (SSN-575) to insulate the hull.

Because of the cost saving, generated by the new Superinsulation, the cost of the hull is reduced. The new Superinsulation is used on the hull of the USS Avond (SSN-575) to insulate the hull. The new Superinsulation is used on the hull of the USS Avond (SSN-575) to insulate the hull.



THE H. L. THOMPSON COMPANY
1725 CORDOVA STREET
LOS ANGELES 7, CALIF.

USAF CONTRACTS

Following is a list of recent USAF contracts announced by Air Materiel Command:

Maxwell Laboratories Co., Inc., 11214 Eighth Avenue Blvd., Los Angeles, California 90049.
General Electric Company, Inc., 111 W. 42nd St., New York, New York 10036.
General Electric Company, Inc., 111 W. 42nd St., New York, New York 10036.
General Electric Company, Inc., 111 W. 42nd St., New York, New York 10036.
General Electric Company, Inc., 111 W. 42nd St., New York, New York 10036.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast write-off. Fast write-off permits property to be depreciated in five years.

Thompson firsts that make T.P.M. valves best

Thousands of Thompson T.P.M. Valves are piling up creating service records in military and commercial aircraft engines. Hundreds of hours of severe service leave T.P.M. Valves looking literally as good as new. Time between valve overhauls is lengthened. Maintenance costs are reduced, lost flight-time due to valve failures has been practically eliminated.

Here's why:

ALLOY

TPM is the new valve material developed by Thompson to give greater corrosion resistance and higher strength.

SNOT FEEDING

mechanically hardens TPM stems to provide longer service with less wear.

CONTROLLED ATMOSPHERE

application of a Thorngren-developed hardening material by arc-weld, assures a tough, homogeneous layer to resist high bend deformations.

ENGINEERED HEAT TRANSFER

the sodium cavity is carefully designed to provide the correct rate of sodium cooling of stem and head.



VALVE DIVISION

Thompson Products, Inc.

CLEVELAND, OH, OHIO

MOTOR DRIVEN PUMPS

FOR AIRCRAFT

ADEL presents a wide range of Meter Driven Aircraft Hoses, Air-Ling, Hydraulic and Fuel System Pumps with a wide spread in capacity and applications. Completely designed and manufactured by ADEL, they meet or surpass all AN standards to provide dependable pump performance. Illustrations indicate the compact, selective series of dimensions ADEL can produce a complete line of Aircraft Hydraulic and Pneumatic Control Equipment, Engine Accessories and line supports.

For complete engineering specifications and manual, address: ADEL DIVISION, GENERAL METALS CORPORATION, 8775 Van Ness Dr., Burbank, California.



Manufacturers of Aircraft Equipment

DIVISION OF GENERAL AFFAIRS CORPORATION • SUITE 1000 • BOSTON, MA 02111

Cambridge 422. POWER & POWER DISTRIBUTION CORPORATION LIMITED



FINGER ON THE PULSE...

at more than 40,000 feet!

Can a man jump from eight miles up—and live? In an exclusive study of high altitude bailouts the Aero Medical Laboratory of the Air Research and Development Command's Wright Air Development Center has conducted numerous tests. Few of these were more spectacular than the world's record jump of Major Vincent Massa, USAF.

Major Massa fell free in his special ejection seat for 27,550 feet before his chute automatically opened, bringing him down the additional 14,000 feet in safety. And at every instant of this drop the Air Force had its finger on his pulse... and temperature... and respiration. His equipment

weighed only 70 pounds, yet it included a complete Bendix Radio Telemetering System which relayed his physical condition to the ground station.

Bendix-Pacific developments, like its instrument Telemetering Systems, are meeting today's combat problems with advanced and proven electronic developments.

This division specializes in radar, radio control, electronic screw components and telemetering systems which give you data, and

It runs for a free copy of a booklet describing this division's contribution in electronics



Pacific Division

Bendix

EQUIPMENT



LAA AIRWAYS' first Sikorsky S-55 in flight on proving run of world's first converted helicopter around coast



ACCESS DOORS removed, S-55 undergoes 240-hr check



AUTO TRIM stabilizes lift which averted one maintenance problem

S-55 Proving Run a Success, LAA Says

But some maintenance problems involving conversion from military to civilian use are encountered.

By William J. Conklin

Inglewood, Calif.—Everest, one of Los Angeles Airways' first S-55 helicopters, turned up a number of maintenance problems but showed the Sikorsky craft easily adaptable to the world's first air-lifted helicopter around coast.

"The S-55 has proved to be a first class piece of equipment maintenance-wise," says LAA President Clarence

Bellon. "We've had a number of trouble with it and have received numerous suggestions from the Sikorsky plant."

Most of the maintenance problems concerned conversion of the S-55 from military to civilian use, according to LAA Superintendent of Maintenance Harry Bolander.

► Scheduled Operations—Bells have full confidence in the craft after flying it

on twice-daily schedules over the Inland Route II between Los Angeles and San Bernardino. One pilot and the S-55 in comparison with the S-51 handles like a Cessna compared to a Twin.

LAA has now taken delivery on its second S-55 with three more on order. The line also expects three S-51s on its 350-cc. model.

The first S-55 was undergoing 240 hr inspection when the second was delivered. The 240 hours were completed between June 10 and Sept. 15 with a 3 hr working flight daily supplementing two 1-hr scheduled flights. Thirty hours of



Flight Simulation WALK-IN ROOMS

**VIBRATION and
ACCELERATION
TEST FACILITIES**

Bowser Environmental Simulation Test equipment has always been known for its high level of accuracy with tested government specifications. Bowser test rooms include tests with a temperature range from -100° F. to +200° F., relative humidity simulation from 20% to 95% and unlimited altitude simulation. In addition, these rooms are specially designed to be equipped with vibration machines to permit simultaneous testing under conditions of vibration, a pressure, low temperature and altitude.

Bowser Walk-In Rooms are engineered for completely automatic operation. Doors, available up to the full size of any van, can be mechanically controlled to conform with dimensions of size, type and weight. Performance characteristics, such as rate of climb, pull down, etc., are available to meet any government or military specifications.

✓ LIVE AND MAIL TODAY

BOWSER TEST ROOMS, Inc., 10000 E. 1st Ave., Denver, CO 80231

Send information on test equipment details:

- | | | |
|--|--|---|
| <input type="checkbox"/> High Temperature | <input type="checkbox"/> Temperature Shock | <input type="checkbox"/> Vibration Resistance |
| <input type="checkbox"/> Low Temperature | <input type="checkbox"/> Humidity Simulation | <input type="checkbox"/> Altitude Simulation |
| <input type="checkbox"/> Pressure Simulation | <input type="checkbox"/> Acceleration | <input type="checkbox"/> Shock Resistance |
| <input type="checkbox"/> Vibration | <input type="checkbox"/> Shock | <input type="checkbox"/> Shock Resistance |
| <input type="checkbox"/> Shock | <input type="checkbox"/> Shock | <input type="checkbox"/> Shock |

Name _____

Company _____

Street _____

City _____ State _____ Zip _____

BOWSER

TECHNICAL REFRIGERATION

DESIGNER BOWSER INC.

TERRELLVILLE, N.C. 28686



EASY DISCONNECT allows to move gear box, rotor head and motor speed knob.



ALUMINUM SHIELD protects steel.



LAAN'S BRACKET for landing-light revision.

operations therefore fell due about once a week.

A broken spring-loaded pushrod caused a forced landing on Sept. 5, but the pilot got the craft down in a field on auto-rotation without damage.

One reason for LAAN's misadventure was clear during the 240-hr inspection. Where it required a full day to remove the rotor, rotor head and main gear box of the S-51 Skottland's case did the same job in the S-55 in two hours.

After the S-55's three-month posting, a number of modifications were made which still are in the planning stage.

► Instrument Panel—Major instrument panel changes are planned, involving both instruments and switches.

► Spray H-3 Gyro Horizon and Spray C-1A Gyrocompass elements, now in use in the S-51, will be switched to the S-55.

► Carb air temperature indicator may be replaced with a carburetor mixture temperature indicator, since operations level the latter is more accurate. A test gauge is being installed to gather data necessary for CAA approval of the change.

► Volt ammeter and hydraulic pump pressure gauges, as well as the carb air pressure indicator will be moved to bring them closer to the left of the pilot to a position more easily in front of him to eliminate parallax error.

► Fuel instruments, fuel mixing pump, such as manifold pressure gauge, tachometer and engine indicator, will be installed.

► Switches and safety controls for the rotor battery and generator will be rearranged for a more convenient switch grouping.

► Rotor Pump—Another major modifi-

cation is conversion to an automatic auxiliary fuel pump. As a safety feature, Operations wishes to make the boost automatic rather than depend on the pilot's memory. Installation of a pressure switch tapped into the fuel system will automatically cut in the fuel boost pump at about one drop in pressure.

To prevent the boost pump from operating during starting operations, a microswitch will be installed on the engine control so that the boost will function only when the engine is out of idle cutoff.

A red light flashing on the panel as the pressure indicator will warn the pilot he is operating on his auxiliary pump.

► Lights—Several of the changes involve lighting to adapt the indicator needed to LAAN's test operations.

► Location of landing lights on the bottom of the rotor head proved to be unsatisfactory in night flying, since some tilt deflected the lights downward and the pilot was unable to see the heliport ahead of him as he approached. CAA approved changing of the landing lights forward to the engine access doors on the fuselage side.

► Installation of a flashing red navigation light on the rotor is planned to make the craft more easily visible at night in the near Los Angeles International Airport area.

► Landing light switch bracket was installed and switches moved near the pilot's thumb as the collective pitch stick. Previously, pilot's hand with its controls for different night landings and takeoffs along LAAN's 754-helicopter route, found landing light switches in an awkward position.

► Other changes involving lights include relocation of the engine compartment light switch to a more convenient position and relocation of a landing light to be mounted on the landing gear strut to facilitate night landing at night by illuminating the side of the heliport.

► Radio—Complaints from the pilots of excessive noise background noise led to discovery that noise magnets blocking, which could not be removed immediately, was causing the interference.

Maintenance first installed jumper bond from harness to shield to break noise waves, but not perfect, results showed magnets shield, ordered from General, was now being tested. If satisfactory, they will become permanent equipment.

► Passenger Operations—Future passenger operations will require, in addition to installation of seats, two other changes: one rotor and one major.

► Installation of a "hush" safety between swiveling legs in the cabin.

► Relocation of the alt electrical component. At present the only access to the alt baggage compartment is from



Forging...

A STRONGER NAVY AIR ARM

Two C-119s, used in the "over 600 mph" class, is the latest member of a long line of Navy fighters produced by Consolidated Aircraft Engineering Corporation of Bethpage, Long Island, N. Y.

Aerial maneuver at the speeds attained by the C-119s demand surface strength which only forging can provide. Consolidated Industries continues to keep pace with aircraft design requirements by constantly improved forging techniques.

We forge titanium, aluminum and steel to your specifications. For full information write Dept. W-12.

CONSOLIDATED INDUSTRIES, INC.

West Chester, Connecticut, U.S.A.

West Coast Representative:

A. C. Stevens Co., 2001 San Francisco Blvd., Glendale, California.



linking the Americas by air

Panagra
FOR AMERICAN CROSS AIRWAYS
and COLLINS

Keep good neighbors in touch

Overnight to Buenos Aires . . . daily via the short route down South America's west coast . . . this is the "Red Carpet" air service that has made Panagra one of the leading international airlines in South America. The men who pilot Panagra's luxury fleet of DC-6's and DC-6B's rely on Collins' communication and navigation equipment to maintain daily, overnight service on schedule. Collins research, design and precision production skills provide Panagra with radio and electronic equipment second to none in accuracy and dependability.

Known as the "World's Friendliest Airline", Panagra treats every customer as an honored guest, actually rolling out a red carpet at every airport of call. El Inter Americano, Panagra's deluxe service, is the ultimate in air travel . . . extra fast, with such luxury flight features as the Fiesta Lounge, Gourmet Galley meals, bed sized berths and pressurized cabins. In its 24th passenger-pleasing year, Panagra maintains the only international airline giving daily DC-6 service to our South American neighbors. Panagra's silver streaks across the equator to North and South America with bonds of acquaintance, keeping good neighbors in touch.

In Radio Communications and Navigational Equipment, it's . . .



COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. Third Street, NEW YORK 26

1700 McLean Drive, DALLAS

3700 W. Olive Avenue, TAMPA

DOUGLAS
DC-6B TRANSPORT



Equipped with
WITTEK
Aviation
HOSE CLAMPS

STANDARD OF THE INDUSTRY
FOR OVER A QUARTER CENTURY



WITTEK MANUFACTURING COMPANY
4305-15 WEST 24th PLACE • CHICAGO 25, ILLINOIS

80521-79 TYPE WND (Designed with one piece handles)
80521-78 TYPE WSS (Designed with folding wings)



inside the tubes where the screws down would be difficult to reach when they are installed. It is planned to relocate the electrical equipment, such as radio, battery and inverters in the cargo compartment and make the present electrical compartment into a baggage compartment since it has an outside access door.

• **Maintenance**—Several changes have been recommended by Hamilton to speed up ground work.

• **Inductor vibrator** will be adjusted. In its present position, mechanics have to disconnect the lead between the inductor vibrator and the magnets to dip out the magnets and coil. By adjusting the inductor vibrator over a few inches this will be unnecessary.

• **Clips** will be fabricated to replace the cotter pins now holding the ring cowl, to speed up access.

• **Air filter** will be modified for quick removal. It now takes about 12 to 15 min. to remove and install the filter, which must come out every 30 hr. The removal time will be cut to a few seconds by replacing present screws and nut plates with quick disconnect fasteners.

• **A center section support**, as a safety factor, will be provided on the thrust of the prop shaft, which is in a position where it could be bent easily during maintenance work on the newly clutch compartment.

• **Easy "bug"**—LAA's discrepancy in parts on the power run cover issue of the "bug" found in the S-55.

• **High-frequency flutter** and constant breaking of wire from stabilizer fins during flight loosened nuts at the root of the stabilizer. An S-55 crash in Texas which killed two Air Force officers is believed to have been caused when these stabilizer fins tore loose in flight and fouled the tail rotor. LAA has replaced the nuts with Chem-nuts.

New reports that removal of these stabilizer results in no change of flight characteristics at speeds below 90 knots. LAA operator below that speed and may add permission to remove the fins.

• **Left nose strut**, passing through the engine compartment near the subject baggage, overhauled to the point where it was too hot to touch. This resulted in an unlined portion of the strut due to uneven ript degradation. This in turn resulted in an unstable condition at low speed, with the blades out of phase. It also meant possible warpage of the left nose strut which would result in the wheel not centering after takeoff, thereby causing loosening of the left nose struts during roll on landing.

LAA attempted to correct the condition by installing an experimental aluminum shield lined with asbestos between the strut and the subject pipe. Pressure in the strut also was lowered. These measures brought some relief.

T-W HAS the DOPE on ORDNANCE



World War II experience
brought up-to-date

This double unit Brown Walker made from plates in Portland. With double construction, the welder can weld from plates in all sizes of production lots 15,000 to 50.

• **Save days of engineering and planning**—the information you need is in the T-W files. Bring your constant problems to T-W—take advantage of previous experience and collected data. T-W men can help you with your best show you how to approach the job; how to install the equipment and how to produce the parts. The listing at right shows a few of the items which T-W customers are producing on T-W welders. Call on Taylor-Winfield and the men who know from experience how to handle specifications covering ordnance items.

Write, wire or phone Taylor-Winfield.

A Few of the Products Made on T-W Welders

- BLAS PLATES ON PROTECTORS
- AMMUNITION BODIES
- SAFEGUARD PIN ASSEMBLIES
- 40 AND 50 MM TRINCH MORTAR PIN ASSEMBLIES
- SHOCK CONTAINERS
- PRACTICE AND LIVE AMMUNITION BODIES FOR ASSEMBLIES
- GRENADES
- REPAIRS LAUNCHERS
- ARMOR PIERCING SHELL ASSEMBLIES
- COMBAT HELMETS
- BUZZARD CORPUSCULES



Ballistics Welder (Type 100)

Sales and Service to All Principal Cities

TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD COMPANY • WARREN, OHIO



Harmeco AIRCRAFT DEFUELER and fuel transfer unit



Port motor. Automatic air transfer unit.

- Maximum Efficiency
- Flexibility
- Durability

Defueler pliers, or transfer fuel from such storage tanks or tank trucks in plants 30 to 150 GPM. Handles vapors as well as liquids.

Multiple small defueler units in lines or one full flow defueler, when all manifold valves open. Pressure simultaneous defueling of several tanks. Pump action manifold also fitted with single

rod for large hose to accommodate increasing flow for engine start defueling or transferring fuel from storage to such tanks, barrels or direct to planes. Each section has two visible flow glass and gas valve.

Model #5521 (standard), has explosion proof motor, also available with gas motor with safety device.

Write for complete information

HAERMAN EQUIPMENT COMPANY
3495 East Olympic Blvd., Los Angeles 23, Calif.

When you think of STAINLESS STEEL FASTENINGS think first of ANTI-CORROSIVE



Anti-Corrosive has millions of stainless steel fastenings in stock for immediate delivery... plus exceptional price-advantage reputation that can aid your requirements beyond steel sheet factor, however!

FREE — Write for Slide Chart 110 which actually illustrates ANI anti-parking in stainless fastenings.

Anti-Corrosive
Metal Products Co., Inc.
Manufacturers of STAINLESS STEEL FASTENINGS
CIRCLE 10 ON READER SERVICE

25 YEARS OF
UNCOMPROMISING
CONSTITUTIONAL
STAINLESS STEEL

but from are not just for condenser.

• **Through to copper and malleability of the face wheel unit was concerned by early inspection.** Damage resulted in excessive end play to the main drive shaft and copper chips in the face wheel unit. Malleability applied in experimental nylon bag which proved very satisfactory.

• **Rivet trouble developed when drop hammer rivets loosened, threatening loss of counterweight arms.** Cause was attributed to pilot technique. Normal procedure for line pitch holds the blades down on the blade rest when the tight-cut pitch is applied at high rotor rpm, the counterweight drop not any earlier, putting a tremendous shear force on the rivets. Maintenance resolved this by replacing the rivets with steel screws and Electric Stop Nuts.

• **One of the main blades was replaced when a 7-in. squariness appeared on the bonded edge of one of the water pack cuts.** This squariness appeared in lesser degree as other pack cuts, which also developed cracks in trailing edge rivets. Slightly wetted closely with LAA in this problem.

• **Cracks in the structure at the base of the battery rack led LAA ground crew to believe the battery rack was improperly supported.** They repaired the crack and installed battery supports with success.

• **Impeller tooth pattern in the tail rotor gear box resulted in rubbing and rubbing over of material in the outer edge of the gear teeth.** The gear was replaced with new factory parts.

• **An oil leak in the tail rotor seal was traced to a defect in the machined face of a casting.** "It appears that in subsequent material was obtained to trace my surface during consideration," says the LAA report.

• **Sharp edges of holes cutting into an O ring caused some seal leakage on four occasions.** The holes were smoothed and polished smoothly by Maintenance to eliminate the trouble.

• **Routine maintenance problems included a tight ball at the parking brake valve, chafing of exhaust metal bolts, and chafing of a sheet metal pull rod on a screw lever in the main gear box.**

• **Analysis—Maintenance.** Separate test of Rotax 100000 tests that position of the P/W R336 engine in the forward position with wide-opening screws down is a great improvement over the S 51. As some of the less obvious advantages are clear smoother engine operation and less inspection trouble. Marginal, as long as the engine, can have from oil dripping.

One of Rotax's main complaints about the S 55 concerns difficulty in removing various sections of engine as the military service. Covering covering the transmission of cover and its assembly, which must cause all day



REYNOLDS ROLL-FORMED ALUMINUM SHAPES

Save Time and Money For Volume Producers

Basic structural parts or parts for decorative or functional trim can be quickly and economically roll-formed for your product by Reynolds Parts Division. Many hundreds of standard roll-formed shapes are available without tooling cost thanks to Reynolds tremendous tooling investment. Tooling for special shapes can also be supplied by Reynolds or work can be produced from your rolls on Reynolds roll-form equipment.

Aluminum and roll-forming combine to offer the important benefits of strong, light, uniform shapes that are easily and economically bent, welded, assembled and ground to tolerance. Aluminum Trim-A-Roll roll-formed profiles tolerances for your individual product requirements. Natural, anodized, painted or other finishes are available.

Whether you make latches or baby carriages, metal furniture or fuses, television antennas or tracks, window sections or window casements... these and thousands of other products can be produced faster and cheaper in volume by using roll-formed aluminum shapes from Reynolds. For additional information, write for catalog or call the Reynolds office listed under "Aluminum" in your classified telephone directory. Reynolds Metals Company, Parts Division, 2029 South Ninth Street, Louisville 1, Kentucky.

Reynolds Aluminum Fabricating Facilities

- One of the country's most complete facilities for aluminum roll forming includes:
- Over 190 mechanical presses ranging from 2 to 1700 tons.
- Hydraulic presses from 300 to 5000 tons.
- Equipment for shearing, blanking, forming, riveting and welding, roll-forming, bending and assembly.

These facilities can serve a single lot of shapes or fabricated parts in your quantities and production requirements.



REYNOLDS ALUMINUM FABRICATING SERVICE

BLANKING • DRIZZLING • STAMPING • BEARING • BENDING • FORMING • ROLL FORMING • TUBE FORMING • WELDING • FINISHING

Darnell CASTERS & WHEELS

THEY PAY
FOR THEMSELVES



Nearly 4000 TYPES of CASTERS & WHEELS

• Save Money,
Floors, Equipment
and Time by using
DARNELL Casters
and Wheels... Always dependable,

DARNELL
CORPORATION, LTD.

Free
Manual

OWNEY, Clark (Anglo-American) CASH.

40 Mulford Street, New York 15, N.Y.
24 North Clinton, Chicago 10, Illinois

18 in., as well as screws and nut plates. Rotated would prove a task for them.

The covering to the main gear box also is a problem to get on and off, he reports.

Tearing over the fuel tanks on the bottom of the aircraft is held in place by numerous screws and nut plates, which LAA would like to see replaced with quick-disconnect fasteners.

Another maintenance difficulty is the operational specifications put out of place. The main rotor lead requires overhaul at 500 hr, but the compressor, a part of the lead, is scheduled for 100-hr overhauls. Two overhauls on the main rotor lead then get the compressor out of phase and the ground crew is unable to overhaul them as a package. Likewise, the compressor attached to the main gear box has a 500-hr overhaul period while the gear box itself has a 100-hr period, again throwing maintenance work out of phase.

OFF THE LINE

Hawkins Aircraft has come up with a practical idea for the benefit of its passengers and crews. Walkways to the planes are raised a few inches above the ramp. This helps to keep feet dry when sudden downpours, to which the flights are sometimes subjected, temporarily close loading areas.

Pan American-Guest Airways is installing K2001 Rail & Wharfway Aircraft systems in service at its DC-8s operating in South America to help planes carry a payload out of such high bays as La Paz's El Alto Airport (11,795 ft.) as Bolivia. First installations have been completed and are in operation.

United Air Lines is installing Bendix Scabbie portable electronic systems on its fleet of six Boeing Stratocruisers. An additional six Scabbies are being installed on UAL's DC-8s (or -40s) for service test. An airline spokesman says the decision on UAL's Stratocruiser 740s will "probably" model the decision we reach on the DC-8s. "In this situation the analysis can be carried out whenever it is considered necessary.

Engine malfunctions on Trans World Airlines' 460 Comets have taken a sudden drop, according to airline spokesman. Part of the improved performance is attributed to using new, night-flying paper pins, using new cylinders in critical locations and pulling 180 hp less in cruise.

3 hi-shear FACTS THAT COUNT!



1 minimum protrusion

Hi-Shear joints have the smallest protrusion of any high strength fastener.



2 maximum smoothness

The smooth tapered ends, self-aligning shims and self-aligning shims, provide smoothness in the fastener's path, minimizing stress and strain.



3 less weight

Hi-Shear joints are the lightest high strength fasteners available.



also

Compared to standard bolts and nuts, Hi-Shear joints are 10% lighter than standard bolts and nuts.



write for

Free literature: Darnell Corp., 40 Mulford Street, New York 15, N.Y.



HYPER-BELLERCA AVIATION
LOS ANGELES, CALIF.

NEW AVIATION PRODUCTS



Stratons Units Cool

Hot Sabre Cabsins

A new refrigeration unit for North American F-86 Sabres is being shipped in quantity by Stratons Inc., Fairchild Engine & Airplane Corp.

The equipment, NURH15, delivers air at a temperature of about 23F, or actually around 15.5 F, according to the company. It consists mainly of three parts: two heat exchangers and an expansion turbine weighing 17 lb in all.

Air for cooling the cockpit is drawn in and at high pressure from the jet engine compressor section, passed through the first heat exchanger, cooled some, passed through the second heat exchanger for further cooling, then given a big chill going through an expansion turbine, after which it is ducted directly to the cockpit where a coil and then expands out through a pressure-regulator valve.

Each of the cooling units—heat exchangers 1 and 2 and the expansion turbine—is for refrigeration almost cool by different means.

• Expansion turbine: Cockpit air is ducted through the expansion turbine, expands and gives up energy in turning the turbine wheel. The lost energy is represented by a drop in temperature and pressure.

• Exchanger No. 2: Cockpit air is refrigerated here by indirect air which is drawn through the exchanger by a blower. The blower is mounted on the same shaft with the expansion turbine and provides the turbine wheel with a means of absorbing the energy which it absorbs from the cockpit air in cooling.

• Exchanger No. 1: Here air enters the hot jet compressor air as it passes through on its way to become refrigerated air for the cockpit.

The cockpit cooler is the latest in a broadening line being developed and produced by Stratons. Units with expansion cooling from 15 lb air, for a

New engine, to 60 lb./min. for the cockpit of a jet bomber are being produced. Others for delivery purposes of 100 lb./min. are in final development stages, the company reports.

Stratons Inc., Fairchild Engine & Airplane Corp., Bay Shore, N.Y.

Accurate Drill for Jet Engine Housings

A production tool for drilling jet engine housings in steel with identical locations has been announced by Modern Industrial Engineering Co.

A two-way drilling and tapping machine, the equipment features multiple drill heads on two of the six stations. The tool is designed to pre-align precise work on manually low production skilled men with minimum setup. The jet engine housing is loaded and clamped to the drill fixture manually. Indexing also is by hand.

Here is the sequence of operations: The dimensions allow jet engine housing is loaded on fixture and its position is located by an outside diameter ring and a pin in a bolt hole; fixture is rotated by hand to position where individual hold-down clamps can be tightened; fixture is brought to starting position and the index later is operated to lock it in place (with rotation of lever, three interlocking index table hold-down clamps are applied); a start button is pushed to set a counter and initiate the automatic selection of head combinations.

Indexing between operations is done manually by rotating the table after the index pin and clamping cylinders have been automatically released by the return stroke of the handle. The table can be rotated in a clockwise direction only and cannot be returned past home station. New manual releases can place the multiple drilling and tapping of holes in the housing.

The machine weighs 28,000 lb., measures 45 ft. wide, 10 ft. deep and 51 ft. high.

Modern Industrial Engineering Co., 14230 Sherwood, Detroit 4, Mich.

Aircraft Valve

An extending valve for aircraft by double systems which the master acts as a quarter-opening and better protected from foreign matter is being produced by Vickers, Inc. It is the latest in the 400-1900 series made by the firm.

The unit, also known as a passage regulator, has been simplified internally.



New HARTWELL FLUSH HEAVY DUTY COWL LATCHES for Power Parcks and Nozzles

Flush—Positive—Positive Action—Easy to Operate—Lightweight—Simple to Install

The H-5000 Series latches are available in various, compact and straight types. Maximum closure load is approximately 10,000 lbs. static tension. The single mechanism latches in place and applied load holds the latch closed, simple to lock and insure opening action. They provide long, dependable service under severe operating conditions. Weight only 9.5 to 14.2 lbs. including hardware.



Write for complete information data

HARTWELL AVIATION SUPPLY COMPANY

Manufacturers of Aircraft Flush Latches and Airports, Flaps and Cable Terminals
1020 Van Ness Boulevard, San Francisco 40, Calif.
Branch Office: Wichita, Kansas

An Open Letter to Executives in charge of... AIRFRAME Manufacturing

This message is addressed to the executives responsible for outcome assembly or fabrication who have a production problem involving such things as coverings, wing tips, wheel doors, fuselage air scoops & ducting, seats, altimeters, flaps, trim tabs, dorsal fins, elevator trim tabs or related jobs. We operate a fine, modern and completely equipped plant for aluminum metal forming and fabrication of aircraft parts and assemblies. Our equipment and facilities include:

- | | | |
|------------|-------------------------|------------------------------------|
| 1. Stamps | 5. Stretch Presses | 8. Complete tool making facilities |
| 2. Formers | 6. Aluminum Heat Treat | 9. Dies |
| 3. Hammer | 7. Painting & Finishing | 10. Fixtures |
| 4. Presses | | 11. Aircraft Dies & Heat Treat |

Our plant, with 50,000 square feet, is well equipped with tooling facilities of every aircraft manufacturer and prime contractor on the West Coast. Our experience includes executives and engineers with years of aircraft experience. Work plans accepted on negotiated or bid basis. We invite your inquiry and personal inspection of our facilities.

Bill Modglin
President

MODGLIN CO., INC. 3215 San Fernando Blvd., Los Angeles 45, Calif.
Phone: Cleveland 8-2212

SPECIAL NAILS RIVETS SCREWS



Hassall

ESTABLISHED 1928

Special cold headed products:
nails, rivets, screws

...made to order in any metal



HASSALL SERVICE

Raw material inventory of Manganese Steel, Stainless Steel, Copper and Copper Alloys on hand. Send drawing—advise quantity.

JOHN HASSALL INC.
141 City Street, Seattle 22, Wash.

* Free Catalog on request



DESIGN ENGINEERS AND DRAFTSMEN

With Experience on Airframe,
Equipment, Instrumentation, Hydraulics & Structures

ALSO

**TOOL DESIGNERS
AND PLANNERS
LOFTSMEN
DESIGN CHECKERS**

With Aircraft Experience

■ This is a busy new program featuring the design and development of advanced jet AIRCRAFT, other types of aircraft and related equipment of military and civil aircraft in service. The customer also includes aircraft. Most projects have heavy conditions.

KAISER METAL PRODUCTS, INC.
Red Bluff St. Bristol, Pa.

It has a new screen and a built-in air conditioner check valve. The screen protects the assembly from contaminants in the tank water.

First application of these protection units is in the Cessna 340 twin-engine biplane, on the new hydraulic circuit. This particular part is Model AA-1915A. Other valves can be installed to the new design at Valco's Detroit factory. Various variants are sending them in, the company reports.

In the 340, the part is put to rugged use and must cycle up to 150 times per minute when a check cooling is called for on the ground.

Valco, Inc., 1400 Coleman Blvd., Detroit 31, Mich.

Test Plane Sections

A new dynamometer that can be set for any loading point between 0 and 100,000 lb. and is suitable for widely divergent tasks, from static load testing of aircraft assemblies to spotting of overload on engine and engine in the test, is made by W. C. Dillon & Co.

The equipment, listed Model "EL," indicates loads directly or indirectly. It has no springs, working on the principle of deflecting a calibrated beam. The diaphragm dynamometer is patented against overload and is said not to be affected by extremes of temperature and shock with factory and laboratory use, is applied in field work. It weighs 54 lb. W. C. Dillon & Co., Inc., 1421 S. Cicero Ave., Forest Park, Ill.

ALSO ON THE MARKET

Oil-filled capacitors are suitable for low-temperature operation (—70°F) and where space and weight are prime considerations. Units are constructed of high-purity rubber-type material and are vacuum-sealed to prevent moisture absorption. Included in the series are 600- and 1,000- p.f. models. Industrial Condenser Corp., 1245 N. California Ave., Chicago 18.

Insulated terminal for automatic control panel wiring can be installed with one stroke of tool. The terminal is said to be mounted by an improved method which involves no soldering, reduces exposure of the controlling circuit on the terminal block to mechanically powered. Autotek Metal Products, Inc., Sharnburg, Pa.

11,000 large assembly can be mounted on aircraft instrument panel for wing air functions and other instruments. It weighs 4 oz., length is 7 1/2 in. overall. It is prefabricated in plastic panel base case known in several colors are available. Hedberg, Inc., Sharon, Ill. Pa.

CUSTOM MADE DUCTING FROM LOW-COST TOOLING

COMPLEX
SHAPES

MINIMUM
TIME DELAY

SMALL UNIT
PRODUCTION



AIRTRON FIBERGLASS DUCTING offers many advantages over metal. Ducts can be made in practically any conceivable shape in experimental or production quantities at cost savings frequently as much as 45%. Tooling costs are reduced to a fraction as compared with metal. Costly metal forming, crimping, welding and anvil work eliminated.

Airtron ducts offer other unique features. Weight savings up to 50% are possible. Flexibility allows crimping without damage and repair installation. They are self-shielding and immune to vibration and corrosion, can be made to clear obstacles with special fittings, flanges and other built-in features.

For difficult duct design problems, Airtron offers the world's best design service.

WRITE FOR CATALOG—
an Airtron and name of
current sales engineer
Dept. A-30



**ARROWHEAD
RUBBER COMPANY**

BOWLING, CALIFORNIA (San Angelo) Central
1410 W. 10th St. (San Angelo) 1410 W. 10th St.
P.O. Box 1410 (San Angelo) 1410 W. 10th St.

ARO AIR TOOLS

Speed Assembly at AUTO-LITE



ARO Tools help Auto-Lite do scores of duty jobs of screw-driving and nut-setting... faster and easier... assembling parts for speedometers and other dash board instruments as well as assembling thermometers and gauges and dial-indicating thermometers at their LaCrosse, Wis., plant.

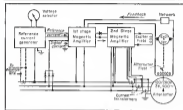
See your ARO distributor for an on the job demonstration, or write for new catalog 66.

Also... LUBRICATING EQUIPMENT... HYDRAULIC EQUIPMENT... AIRCRAFT PRODUCTS... GREASE FITTINGS

The ARO Equipment Corp., Bryon, Ohio.
ARO Instruments of Canada Ltd., Toronto, Ont.

ARO The Leader!
AIR TOOLS

AVIONICS



TRENDS toward use of rugged monolithic in circuit voltage regulators is indicated. Here is schematic of Westinghouse AVR-22 unit.

New-Type A.C. Regulator Shown

Westinghouse mag-amplifier voltage unit uses no tubes, is smaller than others that have been announced.

By Philip Klaus

This new Westinghouse Electric Corp. avoids use of vacuum voltage regulators for aircraft use, presents a new design which uses magnetic amplifiers throughout. Following on the heels of the General Electric mag-amplifier regulator development (Aviation Week Aug. 11, p. 36) indicates use of the solid carbon pile type regulator is on its way out for aircraft.

The way to magnetic amplifier regulation is attributable to their ruggedness, particularly long life, and reliability inherent in their lack of moving parts. Carbon-pile regulators, with their carefully balanced moving apparatus, are inherently sensitive to shock and vibration and lose something in the demand for reliability.

But for the moment, at least, the carbon pile regulator is unique in the d.c. generator field since nobody has yet devised a mag-amplifier regulator to generate d.c.

Design Engineer-GE may have a head start with Navy production orders at hand, but Westinghouse thinks its new Type AVR-22 mag-amplifier regulator has the design edge over its competitor. In addition to the generally acknowledged mag-amplifier advantages of increased reliability, ruggedness, and long life, Westinghouse points to these as clearest advantages of its AVR-22:

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Uses no vacuum tubes. Westinghouse has devised a voltage reference for its regulator which eliminates the cold-cathode type tube GE uses.

- Interchangeability. AVR-22 can be substituted for a Westinghouse carbon pile type regulator and operated with one existing in future power supply range. Westinghouse elaborates in the 15 to 50 kv range, the company says (For best results, the GE mag-amplifier regulator requires an alternator with a speed but output not depend on alternator frequency for use with carbon-pile regulators.)

- Size. AVR-22 occupies about 405 cu in. (roughly the same size as the Westinghouse carbon-pile regulator). The GE unit is roughly 660 cu in.

- Plug-in package. AVR-22 is packaged in a plug-in panel to fit the mounting base used in the standard USAF Type B3 control panel for d.c. regulators. This AVR-22 plug-in feature permits speedy replacement. The GE unit requires removal of five mounting bolts for replacement. Neither regulator requires shock mounts.

On a weight basis, the AVR-22 is only slightly lighter than its competitor. When the weight of these critical control transformers and the mounting base are included, the AVR-22 weighs about 164 lb., about 1 lb. less than the GE.

- Quoted Performance. AVR-22 is designed for 120-volt, 60-hertz ac input. It is designed to operate at 500 to 440 cps. Westinghouse says its AVR-22 will handle voltage control with a constant speed drive at 1400/6000 cps. It gives an output frequency of 500 to 440 cps. AVR-22 will handle voltage control with a constant speed drive at 1400/6000 cps. It gives an output frequency of 500 to 440 cps. AVR-22 will handle voltage control with a constant speed drive at 1400/6000 cps. It gives an output frequency of 500 to 440 cps.

- ±1% over the full range of speed, zero to 100% load, at 0.75 power factor, between the frequencies of 500 and 440 cps.

- ±1% from zero to 100% load.
- ±1% from zero to 100% load.
- ±1% under all conditions and from zero to 100% load.
- ±1% under all conditions and from zero to 100% load.

- No Right Equipment. Yet—Westinghouse tries on its new regulator have to be built limited to bench tests with 40 and 60 kva alternators. However, Westinghouse expects flight tests to duplicate bench test results since the regulator has no moving parts (except for a relay which operates only when the system is first turned on).

- Qualification tests on a production model not scheduled to begin in November, and by early 1953, Westinghouse expects to be able to handle large scale production. Because the AVR-22 was developed with Westinghouse funds and kept under wraps, the company has no orders from either military or civilian.

- Wider Speed Range—Westinghouse is currently investigating the performance of AVR-22 over the wider frequency range of 510 to 450 cps for



AVR-22 UNIT can be mounted compactly in a standard plug-in type of tray.



COVER OFF now reveals how the detector's components are fitted snugly.

Speaking of close tolerance



With World War II came a greater demand for close tolerance and high-precision fasteners, many of which were produced by a former Cooper company. As long ago as 1925, Cooper craftsmen were identified with the improvement of processes in cold bending, involving alloys not ordinarily cold-bended. In recent months, Cooper research has been

pointed toward even more advanced processes and newer alloys such as in the production of MS 29004 Series bolts with cold rolled fillet and in the processing of new lightweight not heat treating alloys. This background of pioneering and research experience is the heritage of today's Cooper organization, well-versed in aircraft quality production.

Cooper P-1 is evident in-
cluding a life of service
MIL, AIR, and NAZ
business applications



COOPER Precision Products

PERFORMANCE IN TOLERANCE ENGINEERING FOR OVER 60 YEARS

505 WEST CENTURY BOULEVARD, LOS ANGELES 41, CALIFORNIA • Ogle 4-2702



MAGNETIC AMPLIFIERS are small. Most of the space is taken up by solenoids.

which one of the present GE magnetic amplifier regulators is designed.

Westinghouse is also at work on a modified design to enable the regulator to handle direct-current alternators having a frequency range of 180 to 600 cps. Westinghouse expects the wide-speed-range regulator to be about the same size as the AVR 22 and weigh about 1 lb. apiece.

■ **How It Operates**—For competitive reasons, Westinghouse is keeping mum on how its reference signal circuit operates. The company says that it does not use vacuum tubes, but uses gas-filled neon devices, batteries or gas-saturated magnets and that it has no moving parts.

The device generates a constant-current signal which is unaffected by the specified variations in alternator voltage or frequency, the company says. This reference signal is compared with a signal proportional to alternator output voltage obtained by rectifying and then combining the three line voltages.

Actual comparison between the two signals takes place in the first-stage magnetic amplifier where each output leads its own control winding. The relative magnitude of the two signals determines the output current level from this stage. A manually operated rheostat can be used to change the regulator's control point by varying the signal from the alternator output voltage.

The first-stage output is amplified and supplied to the control winding of the second-stage magnetic amplifier which feeds the exciter's field winding. This in turn controls the current supplied to the alternator's field winding and thus its output voltage from block diagram, p. 61. The second stage is a magnetic amplifier which is powered from all three phases of the generator.

■ **Wide Voltage Changes**—As mentioned

**Available
for the first time...
a Full-Color
Sound Film**

**STEEL
WITH A
THOUSAND
QUALITIES**



Scientific schools and groups of design engineers, metal designers and technical writers can now receive the first use of this full-color sound film, the first produced in the steel industry. Available in 16 mm. prints, the film is a 22-minute tour of the modern plant of Lebanon Steel Foundry. The picture follows jobs from the blasthouse to the perfect engineering's desk through scope of production to show, finally, a line of the more important uses of Lebanon quality steel Castings. Why the Lebanon Castings are the most important in the growing and industrialized

LEBANON STEEL FOUNDRY
Dept. 1, Lebanon, Pa.
is the Lebanon Valley

LEBANON
ALLOY AND STEEL
Castings



**400 CYCLE
HERMETICALLY SEALED
ELAPSED TIME
INDICATORS**

FOR *Airborne Applications*

The HAYDON 7000 Elapsed Time Indicator indicates operating time of your systems with specific life-span warning systems. This unit offers the unusual advantages of small size, basic reading and 400 cycle operation for such applications as electronic devices, where tubes or other components should be replaced at specified intervals. Reading time indicators can prevent unnecessary servicing, insure timely maintenance that protects against failure in operation.

HAYDON specializes in the manufacture of timing components for standard applications and in the design and production of custom-engineered timing for unique applications. The basic element of all HAYDON timing is our own rugged industrial type motor which assures long, quiet operation. This compact design and ability to operate in any position afford designers unusual latitude.

HAYDON also manufactures a variety of timers specifically designed for 40 cycle, 400 cycle or 5 C. operation in military applications. The 8100 Series "open top", hermetically sealed Time Delay Relays are available in a wide range of delays from seconds to hours.

COMPLETE INFORMATION

Write for information, free sample readings on meters, or drawings, bulletins, or 5 C. meters. 400 cycle meters have delay relays, and elapsed time indicators.

*Enclosures sent with your order.

HAYDON Manufacturing Co., Inc.

Subsidiary of GENERAL TIME CORPORATION

3634 ELM STREET

TORRINGTON, CONNECTICUT



UTICA HELPS



The name, UTICA, denotes long quality forged tools for more than 30 years, now identifies a national supplier of turbine and compressor blades in the aircraft engine industry.

BY MAKING TODAY'S METHODS "OLD FASHIONED"

...there is no horizon on new ideas at **UTICA**

In the forging of turbine and compressor blades UTICA is using the most modern methods, the finest equipment and the skill born of long experience in forging.

But, the constant search for improvements goes on.

Our engineers and metallurgists work and plan continually to make today's methods obsolete.

So, whether you come into contact with UTICA tomorrow or several years from now, you'll find leadership that reflects this constant hunger for progress. UTICA seeks to help most by working most for advancement.



UTICA DROP FORGE & TOOL CORPORATION, Utica 4, New York

MAKERS OF THE FAMOUS UTICA LINE OF DROP FORGED FLIERS AND ADJUSTABLE WRENCHES

to the light at a few altitude and then disappear from sight.

Vt 0528 tower personnel observed a fire in the vicinity of Elizabeth, N. J. It was later established that Flight 141 had crashed at Elizabeth near the intersection of Norfolk Road and Westwater Ave.

INVESTIGATION

Investigation disclosed that the aircraft had last visible light contact with the tip of the tower located on the west side of Selden Ave., immediately followed by heavy impact of the right wing with the roof of an apartment building. This impact was of sufficient force to shatter the right wing just outside of No. 4 engine nacelle, the wing falling into the apartment house courtyard. It was at this building, badly damaged by subsequent fire, that loss occupants were found. The aircraft continued forward along an approximate heading of 200°, making other observations and attempting along a path that terminated at Westwater Ave.

To expedite the investigation and to assure the most thorough examination possible of the aircraft and its components, working groups were formed—Wreckage, Operations, Structures, Electrical and Electronics, and Power Plants and Propellers—composed of appropriate representatives of the industry, FAA, and the State of New Jersey. A CAA termination was in charge of each group.

The Wreckage group interviewed more than 100 persons and obtained written statements from 40 who were able to supply pertinent information. All surviving passengers, whose physical conditions permitted, were interviewed and where possible, also submitted written statements or testified at the public hearing. To summarize the information gathered from these surviving passengers, it appears evident that shortly after takeoff the aircraft made a sudden dip and veered to the right.

Associated with the sudden drop and change of aircraft heading was a sound which engine men vaguely described as "rattling," "rattling sound or shell sound," "noise," "the air engine," "blast of air," other passengers described the aircraft as "bouncing," "rebounding," and "slamming from side to side." Two witnesses, sitting on the right side of the aircraft, both stated that shortly after takeoff they noticed that the aircraft profile in the right side came to a stop. One of these witnesses, an ex-fighter pilot, was interviewed to the extent that he filled in the situation of his last known sighting of the aircraft. He stated, however, that he knows that due to the remoteness of his airport he recalls no details of the flight. The Operations group conferred in efforts to the investigation of the aircraft, including dispatching takeoff weight load distribution, crew history and crew training records, radio records, flight documents, and such other documents and records as are required to be aboard the aircraft. No hypotheses which in any way would affect the operation of the aircraft were found. The aircraft was properly maintained and dispatched, and nothing was found to indicate that it was not in as serviceable condition upon departure from Newark.

The crew was also properly certified,

and previous to boarding the aircraft at Newark for the first flight to Newark had had a rest period of 37 hours and 18 minutes.

Study of the crew history revealed that Captain Furtak had been employed by National Airlines as captain since November 4, 1944, and had accumulated a total time as pilot of 11,920 hours, of which 1,419 hours were in DC-6 equipment. His last 10-month instrument flight check was accomplished on January 3, 1952, with a grade of average. The instrument check preceding this one was accomplished on DC-6 equipment June 6, 1951, with a first grade of average. On June 3, 1951, Captain Furtak successfully completed an instrument check on DC-6 equipment with a grade of average. He had also accomplished three checks since December, 1950, in which he received passing grades.

First Officer Casper J. St. Clair had been employed by National Airlines since December 3, 1949. He had received average or above average of his work and had been recommended in written material. His last flight time was 1,024 hours, with 941 hours in DC-6 equipment.

Flight Engineer Sten was originally employed by National Airlines as a mechanic in February, 1948, transferring to the Operations Department on Dec. 3, 1951, as Flight Engineer. His total flight time was 127 hours, all of which was on DC-6 equipment.

The task of the Structures group was to locate, identify, and make a detailed examination of all portions of the aircraft structure, and make a record of the position and nature of all components, controls, and movable mechanisms associated with the operation of the aircraft. This was accomplished, in the event necessary, before any of the wreckage was moved. A dissection chart was made showing the location of all major portions of the wreckage, and numerous photographs were taken, not only as a permanent record but to be used in future study and evaluation of the material.

Following preliminary examination of the wreckage at the scene and completion of the dissection chart, the wreckage was moved to a place where the material could be stored under cover and a detailed examination of the various components was made. A comprehensive study of the wreckage structure and associated systems revealed no evidence of structural failure, malfunctioning, or impairment in the initial impact with the apartment building. All damage to the aircraft structure and the various components was the result of impact and subsequent fire. A list of welding of rivets and joints on the aircraft showed potential and structural cracks, a checked. As a result of the complete dissection of the forward portion of the fuselage, there was no damage and no indication of any one set of indicators of the load and position prior to impact.

The Electrical and Electronics group found no evidence of abnormal conditions or improper maintenance of equipment, nor were there any indications of internal or external damage and the two observed parts of various cables and equipment, but all such damage appeared to have come from external sources, such as might result from impact and subsequent fire.

Although all parts of the electrical ap-



We're Bull-Headed About Quality

Because it has built a reputation for confidence and loyalty among TMI customers clear across the nation. Our sincere appreciation is shown by placing the work of choosing.



If you, too, want to protect the reputation and performance of your product... and we're bull-headed about quality... you'll like our special polished finish and our flexible ability! The same time you want picture a cold drawn round stainless tubing... stainless steel or alloy... to size G.D. .015 to .025 contact TMI! You can count on the fact! We would make it easier in a G.D.C. 14

TUBE METHODS INC.
MANUFACTURERS OF STAINLESS STEEL TUBING
REPUTATION GUARANTEED



OF Controls

KEEPS PACE WITH A

famous *Grumman* line!

Dependable and rugged

Grumman fighters have contributed

greatly to Naval air strength for

many years. On these fighters, as

well as Grumman's attack and

amphibian aircraft, Aeroec controls

have been specified in increasing

quantities. The latest PGF

utilizes Aeroec float controls,

valves, and pressure controls.

Grumman's latest planes,

still shrouded in secrecy,

will employ Aeroec
controls.

Proud designers

THE THERMIX CORPORATIONGeneral Offices: 1 E. Commerce St.
110 E. Columbia St., Hartford 17, Conn. • 300 East 82nd, Toronto 4, Ontario
GREENWICH, CONNECTICUT**THE AEROEC CORPORATION**

AIRCRAFT DIVISION

GREENWICH, CONNECTICUT

Designers of M-1 and M-2, most of the world's fighters, bombers, transports, and amphibians. Also designers of the world's largest and most powerful aircraft engines. Also designers of the world's largest and most powerful aircraft engines. Also designers of the world's largest and most powerful aircraft engines.

tion and wiring could not be examined by means of airport in the damage resulting from the crash, examination of these parts recovered or otherwise available with the wreckage, for examination revealed no parts which would lead to a diagnosis of faulty equipment, faulty installation, or improper maintenance. The lone propeller bearing any marks was found in the "open" position, normal for disengaged propeller. All spinning facilities were found to be in "cold" position, and no electrical linkage of the controls was detected.

The Ferry Plant group was divided into two sections, one to cover the mechanical aspects of the engines and accessories, and the other the propellers and governor. The position of the power plants and propellers, as they finally came to rest at the scene of the crash, were photographed and plotted on the wreckage distribution chart. From notes at the scene revealed that all three blades of the propeller on No. 3 engine were broken off, as was one blade each from propellers on engines Nos. 1, 2, and 4. The broken portions of all blades were recovered with the exception of the outer portion of No. 1 blade from No. 3 propeller. However, a large piece of such a blade subsequently found in the burned apartment building, when, indeed, was found to be of propeller material and was undoubtedly the remaining portion of the missing blade. Being being recovered from the scene, the donor of the propeller was examined and the low pitch stop position acted and pin photographed.

The engines and propellers were first taken to a more appropriate location for a detailed inspection and examination of parts, and for such further technical studies as the examination of the material indicated.

Damage to the engines as a result of impact and subsequent fire was comparatively light. There was no evidence found to indicate structural failure or malfunctions of engines Nos. 1 and 2 prior to impact. The pins acting of the propeller blades of these two engines, as well as the great portion of blades and leading edge tips, as indicated considerable power was being developed at the moment of impact. Engines Nos. 3 and 4 were completely disintegrated with particular attention directed to any evidence that might indicate structural failure, malfunctions, or overheat. The system to measure fuel oil fueling after days ago, indicated considerable power was being developed at the moment of impact. Engines Nos. 3 and 4 were completely disintegrated with particular attention directed to any evidence that might indicate structural failure or malfunctioning prior to impact, either by visual observation or by functional tests when such tests were possible.

During the examination of No. 3 engine particular attention was directed toward possible evidence of this engine having been subjected to overheat. While no evidence of overheat was found, such lack of evidence is not conclusive proof that no overheat did not occur under the pressure of such evidence. Despite appearance of damage and extent of overheat and the amount of power being developed at the time. Such fact evidence, however, was found to indicate conclusively that No. 3 engine and propeller were rotating in their normal direction and No. 4 engine was stopped.

Wickwire AIRCRAFT CABLE**FOR ALL CONTROLS... ON PLANES OF ALL TYPES AND SIZES**

Light plane or multi-engine aircraft—there's a Wickwire Aircraft Control Cable in the right size and construction for all auxiliary and main controls. Supplied, too, with galvanized or tinned finish and in stainless steel.

You can count on Wickwire Aircraft Control Cable for high resistance to bending fatigue and load stress... utmost safety... and long-

lasting reliability. That's because Wickwire Aircraft Control Cable is under complete quality control from start to finish, beginning with actual steel making. For your greater convenience, Air Associates, Inc. maintains full stocks of Wickwire Aircraft Control Cable in their own and C. P. & I. warehouses. See list of cities below.



DISTRIBUTED BY

Air Associates**LOOK FOR THE YELLOW TRIANGLE ON THE REEL**

CHICAGO—54 57 Union Street
Baltimore, Md.
BELLINGHAM—225 West Main Street
BIRMINGHAM—400 1st St. N.E.
BOSTON—200 South St. East

CHICAGO—183 West 1st St.
CINCINNATI—1224 W. 1st St.
DETROIT—225 West Main Street
DENVER—1000 14th St. N.
DALLAS—1000 14th St. N.

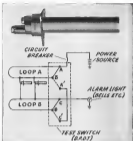
Eastern Air Lines Adopts New Over-Heat Detector



EASTERN'S NEW GREAT SILVER FLEET of Super Constellations, New Year Constellations and Silver Streaks embodies all the latest and finest engineering and design advances to ensure greater ease of maintenance. Dependability and passenger comfort among its many features that make them all here for the first time in the world is a new line and new look designed by a product of Fenwal, Incorporated.



100% 2-DAY INSPECTION is a part of every quality control test taken by Fenwal Incorporated to check accuracy of assembly thereby insuring quality of THERMOSWITCH line and over-heat detectors. Forward quality control is matched by elaborate manufacturing facilities which keep THERMOSWITCH units flowing off the line in increasing quantities.



EASTERN'S NEW OVER-HEAT DETECTOR is a two-terminal, hermetically sealed Fenwal THERMOSWITCH unit. New feature: built-in circuit breaker (due to wire jamming). A single break in either loop does not blow fuse; detector unit. A double break in either loop sets off the detector between the breaks. One push button checks the entire circuit.



A FENWAL THERMOSWITCH DETECTOR (2. See photo above) shows how the contact mechanism on temperature sensing element forms point-to-point — no loose electrical contacts, hermetically sealed, highly resistant to shock, vibration and extreme temperature variations. This detector complies with CAA and S.A.E. requirements. For complete data, write Fenwal, Incorporated, 122 E. Pleasant St., Milford, Massachusetts.



THERMOSWITCH®
ELECTRIC TEMPERATURE CONTROL
AND DETECTION DEVICES

at the time of impact.

As a result of the preliminary examination of the propellers at the scene and a later detailed technical study and evaluation following disassembly, propellers on engines Nos. 1 and 2 were found to be 45- to 75° positive wash mean; the propeller on engine No. 3 was an full reverse pitch, and the propeller on engine No. 4 was fully feathered.

A careful examination of the records associated with the propeller recovery system on aircraft N 56951 revealed that on Jan. 29 and again on Feb. 1, 1952, the oil ring indicating the propeller could be reversed came up and closed up after takeoff. The dip ring should have stayed back out of sight when the wheels left the ground. In both instances the difficulty was corrected by replacing the micro-switch located on the rear wheel end of the main landing gear.

On Jan. 24, 1952, during a maintenance run-up check, it was found that propeller No. 140991, installed on No. 4 engine, also on N 56951, would go to reverse pitch when being taken out of the feathered position. The propeller was removed and taken to the propeller overhaul shop where it was found that possible contact between the dip ring and contact plate was causing the trouble. The dip ring assembly was replaced. This corrected the difficulty and on January 31, 1952, the propeller was installed on aircraft N 56951 on No. 3 engine, in which position it was at the time of the accident.

Investigation declined to continue that the control panel to inspect which is substantiated by statements of surviving passengers.

ANALYSIS

No discussion seems necessary with regard to the aircraft structure, the control system and the related system, since no evidence was found to indicate failure or malfunctioning of these areas prior to impact.

Events prior to No. 1 and No. 2 positions were undoubtedly functioning in a normal manner and developing substantial power at the time of the accident. No. 4 engine was stopped, gone to impact with its propeller in the fully feathered position, which indicates that this condition had been assumed either through action by the flight crew. A complete test down of No. 3 engine revealed not only that it was operating at the time the test was run, but also that the engine and propeller were not operable at the time the test was run. A complete test down of No. 3 engine revealed not only that it was operating at impact but disclosed no evidence whatsoever to indicate that it was not capable of continued operation.

This question will be answered presently with the propeller (No. 140991) installed on No. 3 engine inasmuch as there is one feathering mechanism remaining, its probable pitch position prior to and at impact request with the rest of the quadrant building.

Tenacity of person should the aircraft when it reached the state, it was that of person on the ground who directed the flight following takeoff, has been conclusively refuted. The testimony as to the accident circumstances which would be expected to accompany a sudden reversal of a propeller under power in flight. These circumstances include a sudden engine in reverse thrust, which was of short duration, or



Fighters, bombers, and attack planes are equipped for safe, efficient operation with Bristol engine temperature controllers, timers, other electronic and electro-mechanical control devices. Maker of fine precision instruments for over 60 years.

For help in solving any control problem, call us

THE BRISTOL CO., Watertown 20, Conn.

AN2330-E Leach No. 7204-233 0717
Controls rated 30 Amp Radio and
Motor and 100 Amp Inductive Load
at 25 VDC. Continuous duty and.
Weight 3.311 lbs.



AN2300-B Leach No. 7204-230
Same as AN2330-E except has mounted
terminals and base mounting.



AN2270-1 Leach No. 7204-227 0747
Controls rated 200 Amp Radio and
Motor and 100 Amp Inductive Load
at 25 VDC. Continuous duty and.
Weight 3.311 lbs.



AN1070-B Leach No. 7204-107
Same as AN2270-1 except has mounted
terminals and base mounting.



AN2270-1 Leach No. 7204-227
1971 Controls rated 200 Amp
Radio and Motor Load and
100 Amp Inductive Load
at 25 VDC. Continuous duty and.
Weight 3.311 lbs.



AN2270-2 Leach No.
7204-227-2 Same as
AN2270-1 except has
mounted terminals and
base mounting.



AN2300-1 Leach
No. 7401-1 0717
Controls rated 400
Amps Radio and
Motor Load and 100
Amps Inductive
Load at 25 VDC.
Continuous duty and.
Weight 3.3 lbs.



AN2300-2
Leach No.
7401-2 Same as
AN2300-1
except has
mounted terminals
and base
mounting.



AN2300-3 Leach
No. 7401-3 0717
Controls rated 400
Amps Radio and
Motor Load and 100
Amps Inductive
Load at 25 VDC.
Continuous duty
and. Weight 3.3 lbs.



AN2280-2 Leach No.
7401-280 Same as
AN2280-1 except has
mounted terminals and
base mounting.



FOR BETTER CONTROL THROUGH BETTER RELAYS
—CONTACT LEACH—



LEACH RELAY CO.

5715 AXALON BOULEVARD, LOS ANGELES 3, CALIFORNIA
Representatives in Principal Cities of U. S. and Canada

computed almost instantaneously by closed
switching and serving to the right of the air
craft. There was no testimony to indicate
that any malfunctioning was either based on
left gear to the load motor and abrupt
maneuvers which provided the accident.
The truth to eliminate any action on the
part of the crew in the course of trouble-
shooting, which may have initiated a gun-
polly reversal. Finally, the repeated
diagrams and extent of the maneuvers and
notes that the crew was not adequately up
to the duty of that moment.

The circumstances described would be
expected in the event of a reversal of one
propeller with the engine producing sub-
stantial power. (It should be noted that No. 3
propeller was found at the full or
semi-slow HV position when the door
was moved at the scene.) If the crew did
not immediately recognize that a propeller
had reversed as flight situation might well
have been directed to the forward engine
which in the event of loss of power would
produce a severe screw in that would not
induced engine. It is reasonable to assume
that the comparatively recent maneuvers
which occurred at low altitude and low air
speed, instead of an emergency with such a
breakdown agency in the cockpit that the
crew did not have sufficient time to make
a correct analysis of the difficulty. Under
these conditions the likelihood of No. 4
propeller system to have been a logical
error. The testimony of this propeller
with No. 3 propeller operating at severe
pitch of considerable power would obviously
about performance resulting in a high rate
of descent. However, had the aircraft been
equipped with several pitch indicators
lights in the cockpit, the malfunctioning
propeller could have been quickly identified
and the No. 4 propeller undoubtedly would
not have been involved.

A lengthy study has been made of the
physical condition of No. 3 propeller. There
are a great many parts with significant re-
ductions, and it is not believed that a slow
condition with regard to the position of
the propeller can be moved at on the basis
of one one condition.

It is considered probable that the pos-
sible repeat damage to this blade dis-
plays blade part, and nothing can now
remains while the propeller was in this re-
verse pitch position. A fast rate cor-
responding to plus 20° (see pitch) on the
reverse signal and one this pitch is of
no particular significance. Smaller indica-
tions have been observed on than pitch
and reverse signal rings observed from pro-
pellers in the course of similar certified
performance, the reverse signal ring is of a
thinner section than the show plate with
which it is in intimate contact circumference
trials. It would not be possible to mark the
reverse signal ring for impact loads without
also making the thicker show plate at its
opposite location, and no such marks were
found. The marks which were observed at
the corresponding 20° location are due to
the fact that this is the one fixed position
at which the propeller operates during
ground running, start of takeoff, and initial
climb in climb, and it is this the position
at which the propeller starts when not in
operation.

All evidence on No. 2 and No. 3 Motors
indicated that they were in reverse pitch

**IMPORTANT
ANNOUNCEMENT**

**...to Engineers
and Scientists**

**You can now fill vital positions
in our guided missile projects**

Chance Vought Aircraft, a supplier of high
performance Navy aircraft for 35 years, is
presently engaged in highly classified work
on guided missiles under Navy contract.
These missiles are in restricted production for
intensive experimental use. They are flying
and their performance has been excellent.

Engineering and scientific personnel with
backgrounds in Aerodynamics or Electronics
will find exceptional opportunities for em-
ployment on these interesting projects. Open-
ings are available to personnel with Ph.D. and
M.S. degrees, or B.S. degrees with related
missile experience.

For further information write Engineering Per-
sonnel Section, Chance Vought Aircraft,
P. O. Box 5907, Dallas, Texas.



CHANCE VOUCHT AIRCRAFT

Division of United Aircraft Corporation

DALLAS, TEXAS

J-M Clipper Seals fly with the Sikorsky HO5S helicopter...



Clipper Seal being installed in the intermediate gear box of the Sikorsky HO5S helicopter to seal oil in, keep abrasives out.



Photograph and cross section of Type LPD Clipper Seal. This is just one of numerous styles available to solve tough sealing problems.



Johns-Manville PRODUCTS for the
AVIATION INDUSTRY

...seal all in, keep abrasives out, at critical locations

To enable the lubricants vital to its complex rotor and gear systems... and to protect bearings against the infiltration of abrasives... the new Sikorsky HO5S helicopter depends on these positive sealing qualities of Johns-Manville Clipper Seals.

Clipper Seals are flexible—molded of special compounds, they have a tough, dense body and a soft flexible lip concentrically molded into one piece.

Clipper Seals reduce friction—A specially designed garter spring holds the lip in tight but firm contact with the shaft. Thus a positive seal is always maintained but shaft wear is reduced and over-heating is prevented.

Clipper Seals are corrosion-resistant—The molded body is entirely non-metallic, is therefore unaffected by electrolysis and most forms of corrosion. And the garter spring is available in various corrosion-resistant metals.

Clipper Seals are versatile—They can be furnished in flange sections of varying widths to fit practically any cavity. Various lip designs are available... and various lip compounds provide the proper hardness for temperatures from -65F to +450F.

To find out more about Clipper Seals and their application to your particular sealing problems, write Johns-Manville, Box 60, N. Y. 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

when they contacted the rest of the rotor head building. Both of these blades were twisted by loads tending to turn the blades in the reverse pitch direction. If blades consist of unwarped blades, failure is known on center side, center side of both blades being dislocated by rotating, outward, and press being broken from the trailing edge of No. 3 blade by loads imposed on the center side. Of particular significance is the fact that the disloc and screws which retain the blade gear to the blade were dislodged on all three blades by loads tending to turn the blades toward reverse pitch direction.

No. 3 blade was broken approximately 11 inches from the butt end from a load applied on the free side adjacent to the leading edge. A piece of this blade about 15 inches long was found inside the spinner housing in a partially beveled condition. Unfortunately, the outer portion of this blade as such was not recovered, thus preventing a complete study of all factors.

The direction of break of this blade does not conform to the direction of break of the other two blades. In fact, it suggests a loading which might result from the blades striking an obstruction while rotating in the positive low pitch position. Consequently, much study has been devoted to the various possibilities.

The direction of break of the blade gear disloc and screws is the same as on the other two blades, of which all calculations point to them being in reverse pitch at the time of impact with the rest of the building.

Showering of the blade gear disloc and screws resulted in the blade's being free to turn about its longitudinal axis. Actually, some loads on the blade would tend to turn it away from full reverse toward the positive low pitch position. Some loads on the butt end of the blade would tend to dislodge the blade on the butt end subsequent to showing of the disloc and screws, resulting in the direction of forward of the blade being of an indefinite magnitude in relation to its position at initial impact.

For the propeller blades to be at plus 29° at the initial impact of No. 3 blade and the following two blades to be at minus 15° at the time of their respective impact impacts, the propeller blades would have to change pitch 44° during one full propeller revolution. At 5000 rev/min, this would have to occur in 0.07 seconds, necessitating a pitch change rate of 250°/sec., and would require it to be dislocated from the base of the side of approximately 600 g./sec. Although no substantiating data are available, it is not believed that pitch change rates of such a magnitude could be attained. The normal maximum rate of pitch change is about 10°/sec.

In viewing at the sequence of failure, it appears logical that the disloc and screws dislodged first followed by breakage of the blade. But the blade broken first, it is doubtful if the short portion that remained could be subjected to loads great enough to rotate the propeller to reverse pitch and turn the disloc and screws. Consequently, the only plausible sequence of events is that the disloc and screws dislodged first, leaving the blade free to rotate in the butt end, and with rotation disloc and screws.

The wedge insert was found to be broken



...achieved by EDISON engineers

Vibration in the lower frequencies revised many performance specifications when aeronautical engineers tackled the job of designing rotary-wing aircraft.

In the case of fire detection, Bell, Finocchi and Sweeney engineers sought the system less likely to cause false alarms. The Edison system was selected by all three because of the unique design of its transducer-type detector which has no moving parts and are unaffected by vibration throughout the range from 0 to 1000 cps.

Fire detection on aircraft is a relatively new field, yet EDISON has been a leader since the beginning and is continuously pursuing development of new systems for the future of aircraft safety. Send for free Bulletin AW-13-3003.

MAILING IS BY REQUEST



Thomas A. Edison, INCORPORATED
Aeronautics Division
21 Schenck Avenue, West Orange, N.J.

MANUFACTURERS OF
Temperature Indicators • Paper Circuit
Resistance Cells • Tension Relays • Transmitters

YOU CAN ALWAYS RELY ON EDISON

A DIGEST OF NEW DEVELOPMENTS IN HIGH PERFORMANCE PUMPS

PISTON TYPE FLUID POWER PUMPS



Constant and Variable Delivery Types ... 0.25 gpm to 10 gpm ... direct engine driven and motorized units.

Featuring continuous working pressures to 3000 psi and continuous speeds to 3750 rpm, today's STRATOPOWER oil hydraulic Pumps (both constant and variable delivery types), afford special advantages for aircraft and other applications. The dual pressure Pumps incorporate remote oil pilot controlled pressure regulator. An electric modification provides selective pressure control and Pump unloading. These Pumps are self-priming and develop suction line pressures approaching 1" Hg. absolute and will also operate under conditions of high reservoir pressurization.

VANE TYPE FLUID POWER PUMPS



Capacities 3 gpm to 120 gpm. Sealweld models rated at 1500 gpm ... speeds to 3600 rpm.

A distinctive Dual Vane construction, which provides increased fluid delivery rates (even with extremely thin fluids), makes DUDCO Hydraulic Pumps and Motors the first single-stage vane type proven for 2000 psi operation. The minimum size and high efficiencies of these Pumps and Motors create new opportunities in the design of hydraulic fluid power systems for all types of industrial equipment as well as countless applications on heavy-duty machinery and ordinance vehicles.

GEAR TYPE FLUID POWER PUMPS



1/2 gpm to 120 gpm for working pressures to 1500 psi and operating speeds to 3000 rpm

A unique Four-Bolt design, which locates the assembly bolts within the area of greatest internal pump pressure, induces HYDRECO Hydraulic Pumps for the heavy-duty required in equipment for the construction and materials handling fields. This Four-Bolt design provides the rigidity and stability that reduces distortion of housing parts and wear plates and insures against uneven wear and loss of overall efficiency in the face of extreme mechanical and hydraulic loads.

LIQUID HANDLING PUMPS



Plain or steam jacketed Rotating Plunger or Helix Type 2 gpm to 3200 gpm

Virtually any material that will flow through a pipe, including difficult viscous fluid, can be handled with meter-like volumetric accuracy with today's KINNEY Rotary Plunger and Wide Angle Herringbone Gear Pumps. The Rotary Plunger Pump features a construction with no valves, blades, pistons or springs. The versatile line of Herringbone Gear Pumps includes models driven by timing gears with anti-friction bearings located outside the pump chamber. Both types available with or without heating jackets.

HIGH VACUUM PUMPS



Single Stage and Compound types, 1/2 HP at 2 cu. ft. per min. to 751 HP at 1500 cu. ft. per min.

There is only one principle which has been found suitable for Vacuum Pumps in all capacity ranges ... that of the Rotary Plunger employed in KINNEY High Vacuum Pumps. First to use the oil-sealed Rotary Plunger, these Pumps develop absolute pressure readings of 0.1 Micron (0.0001 mm. Hg.) or better. Alone or in combination with oil diffusion Pumps, they provide the answer to the most exacting high vacuum applications in the electronic processing and research fields.

MOTORS, VALVES & CYLINDERS



In addition to the complete range of Pumps described, there are equally important components ... Hydraulic Motors, Valves and Cylinders ... all available from a single source. DUDCO Hydraulic Motors, employing the remarkably efficient DUAL-VANE principle, with high running torques averaging 90% or more of theoretical at any speed down to nearly stalled and with smooth operation under load. Models rated from 8 to 750 in. lbs./100 psi for 2000 psi operation. HYDRECO Hollow Plunger Valves in single or multiple plunger units for controlling single, double-acting or telescopic HYDRECO Cylinders as well as other Hydraulic Power Units ... capacities from 1/4 gpm to 150 gpm and for operating pressures to 1500 psi. Relief Valves, Pressure Regulators, Flow Dividers and other special purpose Valves are available for nearly any type of Hydraulic circuit.



The New York Air Brake Company and its affiliates provide a most comprehensive coverage of Pumps and related equipment for the needs of defense and industry. Here, in one organization, is "Know How" teamed with advanced facilities and a tradition of precision and craftsmanship. Here is research and development dedicated to the constant improvement and the overhauling service which hydraulic and vacuum equipment can contribute now and in the future.



Catalogs and complete information on the Hydraulic Pumps, Motors and other components herein described are available on request.

THE NEW YORK AIR BRAKE COMPANY
420 LEXINGTON AVE., NEW YORK 17

AFFILIATES: DUDCO DIVISION • HYDRECO DIVISION • KINNEY MANUFACTURING CO.

The Reader His Mark

THE ABC SYMBOL, which is printed at the head of this page, is, in a very real sense, your herald on this magazine. Those letters stand for *Aviation Business*. The symbol signifies that the magazine is a member and supporter of this Bureau.

To the advertiser who contemplates using the magazine as an advertising medium, the symbol has a well-recognized significance. It tells him that the circulation records and practices of the magazine are well open to the members of the Bureau, who check the publisher's claim and make public the precise news and conditions under which subscriptions are obtained. And it assures him that the magazine's way is honored by virtue of a demonstrated demand in its readers as shown by their paid subscriptions or renewed purchases.

BUT HERE we are concerned only with the significance of ABC to you as a reader. For when the advertiser, the advertising agency, and the publisher bandied the figures nearly forty years ago to help establish better circulation figures, they unconsciously set up a cooperative institution that has become a major safeguard for the interests of the reading public.

That is because membership in ABC constitutes one of the strongest guarantees that any publication can offer of its primary devotion to the interests of its readers. And by making that guarantee possible, ABC becomes a major safeguard of the freedom of the press, an objective of exceptional importance in these days when the public is flooded with propaganda from so many sources.

THE RESULT among by which to guarantee a free press is to keep it directly answerable to the reading public it would serve. It follows, then, that the interest of a truly free press must depend on its acceptance by that public; and that means in turn that the people must have the free funds some adequate means for holding the publishers responsible to them.

No one has yet devised any means to that end more simple, more direct or more practical than the paid subscription or renewed purchase plan. The right to purchase or to purchase in purchasing a publication gives to the reader and to no one else the power to pass judgment on whether that publication should continue to serve the reading public.

To guarantee the free process, to check and verify the integrity of the publisher's circulation methods and claims, requires a direct and continuing audit of each publication's success in meeting the test of its public acceptance. To that essential function the ABC has contributed not slightly but the concentrated performance of its members. And that is why we are able to have a press supported, for the most part, by advertising revenues, but not controlled in its circulation currents by any influence other than its readers.

When an advertiser sends the ABC statement of a publication to ascertain the amount, the quality and the trend of its circulation, he does so in the legitimate pursuit of his own interests. But at the same time, inevitably, he is helping the ABC to keep the press responsible and responsive to the reading public. For, in effect, he is asking the publication to demonstrate through an circulation figure that it owes its readers a voluntary demand by its readers.

SOME Audit Bureau of Circulations, by auditing and verifying paid circulation, has come to perform a vital service to the readers of this magazine and of every other member publication. And in performing that service, it helps to maintain in our country a press that is responsible to the reading public and to no other. So long as the practices and principles for which ABC stands continue to prevail in American publishing, we shall find in it a sure support for a truly free press, responsible only to the public it serves.

McGraw-Hill Publishing Company

with evidence that the breaking occurred at some time prior to the accident. The gas turbine engine mount, however, had been installed at the time the slip ring assembly was replaced following the propeller reset of delivery on maintenance entry, Jan. 26, 1952. A fat spot was found in the surface of the low pitch slip ring weld in the area immediately adjacent to the low pitch steps. The possibility that both impact loads were transmitted to the low pitch steps, thus causing the fat spot, has been considered. This did not happen. The evidence of the low pitch steps is such that there would not make a fat indentation on the weld. Furthermore, there are some marks on the surface of the fat spot that correspond with wear marks all around the periphery of the weld. This indicates that there was operation of the propeller subsequent to fracture of the fat spot. It is considered likely that repeated loading on the weld when it was in position for one low pitch step load to transmit the fat spot resulted in the breaking and splitting of the weld joint.

Detailed study was given the drop action between the piston drive and the lip of steel flange over the chambered section at the three points where contact with the low pitch step joint is made. This study was made to determine, if possible, whether the deformation was the result of one impact force of high magnitude or of several of lower magnitude.

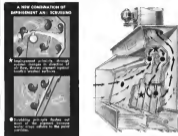
The curvature of the free line of the weld in the broken flange indicates a progressive loading and bending of the metal over and under. Also of particular significance are the three layers of particles embedded in the metal forming the lip which undoubtedly came from the superalloy and of the piston drive. This indicates conclusively that its fracture was the result of a number of smaller impact blows rather than of one impact force of high magnitude.

Tests conducted independently of the Board have been repeated which indicate that information such as were found on the piston drive would have to have been the result of impact loads, but they do not indicate how or when. There is no known manner in which a loading of such magnitude could be generated in flight. Nevertheless, the evidence indicates definitely that the individuals on the piston drive were progressively loaded, this possibility is discarded.

The fact that evidence indicates that the propeller inadvertently reversed in flight raises the question as to what caused this reversal. Due to impact damage and fire, the propeller control system in its entirety could not be examined. There are certain facts, however, which can be established.

Although the system was carefully designed with redundancies in general, nevertheless, some occurrence is not impossible. The governor released valve closed, which extends from the cockpit to the governor on the nose of the engine unit which was not isolated from other circuits, will cause reversal of the propeller if it should become engaged. Should this occur, due to some fault in the electrical system, must act in reversed voltage to the governor solenoid valve circuit, reversal of the propeller would occur without any action on the part of the crew and as long as the

 **Industrial spray finishing equipment**
engineered to your requirements



NEW spray booth design introduces fresh concept to save space, speed cleaning

Binks NEW Dynaprecipitor Spray Booth adds a new twist to old engineering principles for removing paint from cars.

First the booth employs the time-proven scrubbing method to wash out most of the suspended paint particles. This occurs at points marked **1** in illustration above.

Then the new twist. Through sudden, violent changes in direction of air flow, the booth uses centrifugal forces to fling the remaining paint particles onto its wooded surfaces. This occurs at points marked **2** in illustration above. Water then washes the particles into a collection pan where they are trapped for recollection or removal.

Other new features of the booth: collection pan is 1' away from booth glass and major water curdles can be quickly removed without tools for water, better maintenance and operation.

The net results are improved protection against atmospheric pollution, less floor space used, and less water cleaning.

Get your free copy of Bulletin DUC

Find 7 major improvements Binks NEW Dynaprecipitor can make in your finishing department... fully illustrated new design facts in the booth. See your nearest Binks industrial distributor for a free copy or write to Binks Manufacturing Company, 2114 7th Street, West, Milwaukee 18, Wisconsin.

Binks

EVERYTHING FOR
SPRAY PAINTING



GUN • GUN SYSTEM • SPRAY GUN • SPRAY GUN • SPRAY GUN • SPRAY GUN

*Illustrations are intended to be a general guide only. See your classified ad directory.

**VERIFIED STRENGTH**

A vigilant America relies on its aircraft industry
 vital skyways to a nation's strength

The strength of Mr. V. S. Foster can be seen in his office, a small room in the

YOLSHAN is proud to manufacture precision fasteners for the industry whose workfulness helps keep our country free.

VOI-SHAN

MANUFACTURING COMPANY, INC.
8443 Wilshire St., Culver City, Calif. • TRUNK 9-3331

circuit scanner compared the properties could not be taken out of the severe pitch position.

On Feb. 15, 1952, the Administrator of Civil Aeronautics sent to all CAA regional offices the following telegram:

[illegible]

National Airlines on Feb. 13 began a program of rendering the propellers inoperable feature inoperable on all their DC-6 equipped. This was completed on Feb. 25. A maintenance program on propellers was started on Feb. 25, and completed Feb. 26. However, on Mar. 12, National Airlines began a program for the permanent destruction of the propellers inoperable feature on all their DC-6 equipped. This program was completed on Mar. 20, 1962, and is currently in effect.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The aircraft, the aircraft, and the crew were properly certified.
2. The flight was properly dispatched.
3. The weather was satisfactory for VFR operations and had no bearing on this accident.
4. Mechanical difficulty developed during climb shortly after takeoff from Runway 24.
5. No 1 propeller rotated in flight, and No. 4 propeller was feathered.
6. Under these conditions the aircraft did not maintain altitude and settled rapidly.
7. There was no way for crew to cope with the unexpected failure.

PRIDEABLE CAUSE

The final determination that the probable cause of this accident was the reversal in flight of No. 3 propeller with relatively high power and the subsequent feathering of No. 4 propeller resulting in a descent of an altitude too low to affect recovery.

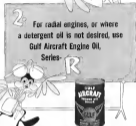
For Your Credit Application Board

- (a) Donald W. Nyrop
- (a) Donald Ryan
- (a) Joseph P. Adams
- (a) Glen Canney

Josh Lee, Member, did not participate in the adoption of this report.

2 EASY LESSONS

for every pilot who doesn't
want to learn about oils
the hard way!



It's the world's first detergent detergent system oil Mowbray says and not to be confused, oil consumption sensors clogging and plug fouling, because it keeps contaminants in suspension keeps them from forming harmful deposits.

Gulf's exclusive Alkylate process—an extra refining step—makes this gasoline pure, extra-efficient. Users of Gulfgrade American Oil Series-D have actually increased mileage between engine overhauls as much as 10,000!

This top-quality, non-derogate straight mineral lubri-
cating oil is approved by Ford & Whitley and meets the
requirements of other aircraft engine manufacturers for
all types of service in piston engines. It may also be used in horizontally op-
posed engines when operating conditions do not require a decrease in

Cummins Auxiliary Engine Oil, Series R, protects sledge and carbon formation, and extends oil life at high operating temperatures.



Now! MICRONIC FILTERING
on Gulf Aviation Gasoline
dispensing equipment...



...assures you of
"REFINERY CLEAN" fuel.
Another great reason
for insisting on...



... that superterrific
GULF AVIATION GASOLINE



Gulf Oil Corporation • Gulf Refining Company

The BENDIX IGNITION ANALYZER Checks More Plugs Faster!

Result: TIME-SAVING

KEEPS PLANES ON SCHEDULE BY ELIMINATING HIT AND MISS TROUBLE SHOOTING

Even before the wheels touch the runway, the ignition bank has been pinpointed and a maintenance crew stands by to make a fast repair. Minutes later the ship departs on schedule. The fix, certain repair job was possible because the trouble shooting was done in flight, by the operator of a Bendix Ignition Analyzer. While waiting a routine check of normal plugs the scope reading showed a trouble pattern. The operator quickly analyzed the location and seriousness of the trouble and the word was relayed ahead. Meanwhile, the pilot reduced power of the malfunctioning engine to cool it in flight and ready it for maintenance. Just such a case as this is the reason why one airline has reduced turnaround time by 18% with the Bendix Ignition Analyzer. It can do the same for you and much more besides.

Write us for free literature concerning
the Bendix Ignition Analyzer.

Bendix

SCINTILLA MAGNETO DIVISION OF
SIDNEY, NEW YORK

Representative: Bendix International Division, 171 Fifth Avenue, New York 10, N. Y.

JACKSON BRANCH OFFICE: 131 E. Philadelphia Avenue, Berkeley, California • Philadelphia Division, 6545 Cass Avenue, Detroit 14, Michigan
Bremen Building, 178 W. Wisconsin Avenue, Milwaukee, Wisconsin • 2422 Market Street, San Francisco 4, California



Costs Less—Does More

The Bendix Ignition Analyzer is available for either airborne or portable-airframe installations. It can be used with either high or low tension magnets or battery ignition. It is the ignition analyzer that can predict spark plug failure before it occurs . . . make an efficient check of more than one spark plug at a time and do so in a large, easy to read screen . . . put it on one of these comparable analyzers.

Bendix
AIRCRAFT EQUIPMENT

AIR TRANSPORT

AA Sets Its Sights on Long-Range Coach

- Carrier reveals tourist plans at nonsked bearing.
- Cost-conscious variation travelers fit in picture.

By F. Lee Moore

American Airlines now sets its gaze on long-range coach service with high-density seating, to get lower unit fares. Americans will increase capacity of its air DC-6s (seats) from 70 to 80 seats and convert line more planes for coach service by spring.

The new policy was revealed in American Airlines' testimony at the Civil Aeronautics Board hearings in the annual airline investigation. Much more of this proceeding is whether CAB should consider its regulations governing airlines from expanding their own auxiliary services. Major statements of American policy were presented by assistant vice president and general sales manager Charles K. Speer.

He and AA believes its largest growth potential lies in vacation travel, 90% of which now goes by automobile. The company believes low fares and intense competition can and must have some of this huge but extremely cost-conscious market to its bowl. "The standard" or first-class market is already saturated. American believes. AA

believes that the scope expansion in air transportation will take place in the air travel field. We believe that the opportunities in the standard fare field are definitely limited."

Speer then broadly outlined AA's prospects in its three markets, which American calls "commercial, seasonal and vacation and tourist."

• **Business travel.** "The commercial market has been deeply penetrated. And he added, "Furthermore, we believe business travel is highly related to the present moment due to war conditions and that, if anything, there is a slight decline in this market."

• **Vacation travel.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

AA, Nonsked Coach Business

American Airlines' new air service passenger business revenue passenger miles, 12 months ended June 30 (first part)

	1951	1952	Change
American Airlines "air travel"	375,492,135	375,492,135	up 137%
All airlines (domestic and int'l)	870,000,000	1,290,000,000	up 49%

* U. S. national passenger miles including government contract flights

Source: American Airlines and CAB Airline Air Carrier Section, Bureau of Air Operations

• **American's coach investment** is \$6,577,118, more than four times that of the 40 domestic airlines, according to Speer. American's cost of converting a standard plane to coach now about \$75,000 each.

These are highlights, here are some of Speer's more detailed statements explaining these conclusions:

• **American's Price Philosophy.** Speer outlined the American fare-and-service policy is a carefully worked statement beginning "We believe that the scope expansion in air transportation will take place in the air travel field. We believe that the opportunities in the standard fare field are definitely limited."

Speer then broadly outlined AA's prospects in its three markets, which American calls "commercial, seasonal and vacation and tourist."

• **Business travel.** "The commercial market has been deeply penetrated. And he added, "Furthermore, we believe business travel is highly related to the present moment due to war conditions and that, if anything, there is a slight decline in this market."

• **Vacation travel.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

• **Seasonal market.** "The seasonal market is being deeply penetrated. The vacation market is being deeply penetrated. The business travel market is being deeply penetrated."

• **First-class commercial market.** "The total first-class commercial market is saturated. The seasonal market is saturated. The vacation market is being deeply penetrated."

category field is substantially limited by its very nature. Emergence is not controlled—they come, and we believe that we probably have a very high percentage of the emergency travel that generally exists as that will move in the future."

Then, American looked its business growth in the standard or luxury class is slowing. Observers studying these revealing statements last week in Washington wondered why the airline still stands stock a prospect probably, especially in view of the fact that American has recently on order 25 new-coach Douglas DC-6s worth close to \$16 million and has recently added to its fleet about 15 additional new-coach DC-6s.

American Airlines, however, will go very recent and future expansion to first-class travel and spend \$75,000 each converting the old standard DC-6s to coach.

Some observers also speculated that in passing to future growth on coach, American is warning CAB not to assign the future of the certificated airlines by acting on standards compete in that vital field.

• **Vacation travel.** "We believe our future lies in the vacation market," Speer continued. "This is an extremely cost-conscious market. They (vacation travelers) have specific areas of interest. They can't be sold, many of them, on spending their vacation in (air travel) areas or on vacation areas. This market is highly seasonal . . ."

"This market is difficult to reach. It requires expensive promotional effort. In this market, time is a valuable asset because time is in the business or commercial market."

American therefore concludes that more will be disappointed. "All this adds up to an extremely cost-conscious market which will be adhered to."

AA 1953 Fleet

American's fleet next year will include—

Aircraft

10 DC-6s (highway)

10 DC-6s (aircraft)

10 DC-6s

10 DC-6s

10 DC-6s

10 DC-6s

10 DC-6s

10 DC-6s

10 DC-6s

10 DC-6s



WESTERN CONVAIR 440. It is adequate to handle the busy Las Vegas route.

Western Faces New Route Setback

United and TWA are hot on the trail of WAL's prized Las Vegas-Los Angeles run.

Las Vegas, Nev.—Western Air Lines, recently awarded its certificate to serve El Centro and Yuma, now faces loss of its exclusive right to the rich Las Vegas-Los Angeles route.

Western's Route 13 stretches nearly east out of Los Angeles across the Nevada desert before swinging north toward Salt Lake City and Canada.

The richest segment of Route 13 lies between Los Angeles and Las Vegas, for it links the heavily populated Southern California area to one of its favorite playgrounds.

Seldom has so an area offered better argument for air travel. The 335-mile trip between the two cities takes 3-1/2 hr and costs as little. By automobile it is a 6-7 hr trip across the desert. Western's calendar lists a trip in 58 min.

■ **Other Interests.** Since 1943 Western has held an exclusive franchise for the Los Angeles-Las Vegas run, which brings in over \$1,135,000 annually, 9% of Western's total system revenue. It has been the route since 1936.

New both United and TWA want Western's short-haul route opened to competition, with Bonanza Air Lines as an extremely interested candidate. A CAB hearing was held this summer and American West recently conducted an on-the-spot survey.

Two interesting points stand out in the controversy:

■ **TWA and United** which step at Las Vegas, already are competing with Western on the Los Angeles-Las Vegas run through the scheduling of departing passengers. Several times a day departing points and then advancing the difference.

■ **Western** faces strong opposition from the town which it helped build in a major airport center.

It is common knowledge in Las Vegas that if you want to take a ticket to Los Angeles on Western, you can have one on TWA or United in Long Beach

for \$135 more and obtain a refund for the difference upon arrival in Los Angeles. The airline also is used in the opposite direction by purchasing tickets to reach farther east than Las Vegas. Both airlines admit the practice, and encourage it.

■ **A Western representative** disclosed that when no space is available on Western, would-be passengers sometimes are told about the midnight flights which permit them to travel on TWA and United to Los Angeles.

■ **Little Damage.** What can CAB do to ease the impasse? Very little, apparently. If a passenger knows about the schedule, there is nothing to stop him from using it. One Las Vegas travel agency owner says he has used the practice to ticket in bulk in 100 passengers a week to Las Vegas.

A top TWA official testified at the CAB hearing on the "slightest absolute possibility of ever entering the situation."

It is obvious that neither TWA nor United can lose its flight schedule as advertising can such services. There is some traffic taking advantage of it in El Centro and Yuma, but Western competes well.

As long as the restriction remains in effect, it weakens Western's near-monopoly of the traffic.

"The question CAB must decide is whether it is in the public interest to continue that restriction for Western. That brings us to a second interesting question: Why is Las Vegas so unkind to Western? What has it done to such money as the town?"

"The traffic now moving over the Las Vegas-Los Angeles corridor is traffic which Western and Western alone accounted for, and has not been provided elsewhere and lost interest in," says Western official.

■ **Traffic Problem.** But another point raised against the airline is change in Las Vegas. The town often a profligate

traffic problem. State population is around 51,000. But there is a heavy tourist flow from Las Angeles on Fri, Sat and a heavy flow back to California on Sunday. Many townspeople resent the fact that no reservations are difficult to obtain on weekends. Hotel people say they are conducting clerical fights to leave in guests because of Western's inability to handle the traffic.

The CAB hearing is just an application of the City of Las Vegas and the Las Vegas Chamber of Commerce for removal or modification of the restriction was reached with bitterness.

■ **Heating Plans.** In one dinner, Western vice president Arthur Kelly told the CAB members "Historically the position of TWA in Las Vegas is shared with local hotels and bookstores here." Western also accused United Air Lines of moral breach of contract in asking to have the restriction lifted after opening it in a condition of the sale to United of Western's Route 66 Las Angeles Denver in 1947.

United's reply "The restriction was put in and was meant to be United at a time when Western was in a very bad financial condition, and when it needed protection against competition if it was to survive favorably. Since that time Western's condition has improved greatly and the protection is not needed, at least it is not needed to the extent it was at the time."

■ **Never Questioned.** Years of the CAB hearing was established by Mexico C. D. Baker in December the official action is slow as application for removal.

Asked if that action was taken after due deliberation by the board of commissioners and himself, the answer is: "I do not know after receipt of numerous complaints from the public and licensed business."

■ **More Complaints.** The move's testimony was followed by complaints on Western service from the restaurant and public relations men of the major Las Vegas hotels, as well as private citizens.

Witnessed with Western's statement is possible in Las Vegas. Townpeople questioned concluded of Western service. Western's defense includes the following points:

■ **Western** helped develop the Las Vegas trade, has continued travel to the city through advertising and is entitled to continue for its efforts.

■ **Western** is providing adequate service to Western Las Vegas (over from \$68 to \$12, or 169%), as well as more than economic growth of Las Vegas for the same period.

■ **Complaints** at the hearing were

wrong, inadequate and not convincing. ■ **Western** would suffer financially to the public detriment through diversion of its traffic to DAL and TWA if the restriction were lifted.

■ **Such action** would endanger the base of Western's route to Canada. One telling point in Western's brief is the extreme overcrowding of hotel facilities in Las Vegas on weekends and holidays. "Even if we brought more people in here, they don't have any place to stay here," said Western official pointed out.

Western flights to and from Las Vegas daily now total 14, following addition of new flights in August with planes available when the El Centro-Yuma corridor closed down. Extra flights operate as weekends and holidays. Western contends it also has the equipment to handle any future increase.

■ **Business Interests.** Although TWA and United have been the principal contenders. Bonanza Air Lines, with base quarters in Las Vegas, is considered another likely opponent for a Las Angeles-Las Vegas route in competition with Western (American West Oct. 13, p. 52). Bonanza executives deny any interest in such a route, but Las Vegas observers insist Bonanza wants the route to close the final gap in its circle from Las Vegas to Los Angeles by way of Phoenix and San Diego.

Three routes are open to the CAB in this case:

■ **Continue** the restriction as it stands. ■ **Modify** it to permit United and/or TWA to run Los Angeles-Las Vegas passengers on that segment of their transcontinental runs. ■ **Eliminate** it entirely, allowing United, TWA or Bonanza to compete with Western on shuttle runs between Los Angeles and Las Vegas.

Western officials, although acknowledging the possibility of some change.

German Airline Courted by Allies

(McGraw-Hill World News)

London—British airline manufacturers reportedly have been offering the German 30 planes, 15 four-engine Vickers Viscounts and 15 de Havilland Doves 3 Coverts, with deliveries during 1954-1955.

DH has denied the story, but the Vickers angle sounds feasible, especially since a Viscount only recently completed a demonstration tour of Germany.

The price for the 30 planes reportedly was set at over \$61.5 million—higher than competitive offers by U. S. rivals. But the British do not re-

quire dollars in payment, and the Germans would see domestic business in the planes instead of exporting them overseas.

Competition to sell is the new market is growing. The Germans hope to get airline orders started next spring using chartered or second-hand transports. The British on selling Doves (C-40) and Vickers Vikings as "European business" planes.

The Germans would like to make an order for British or U. S. transport. One British source told writer on the idea by saying that it will tell the Germans how to improve their aircraft industry. But some Germans are more optimistic—Meissenheim reportedly is negotiating with the city at

Kaun to build an aircraft plant which would employ 1,800 initially.

India May Nationalize

(McGraw-Hill World News)

The Indian Government reportedly is studying legislation that would bring about a compulsory transfer of all existing domestic airlines in India and organize a corporation to run all national air services. Although this legislation is unlikely to be presented to Parliament during its next session, a policy decision is expected to be taken shortly. The Air Transport Inquiry Committee has reported against nationalization for a period of at least five years.



VITAL CHARTS ALWAYS VISIBLE

This transparent chart holder has been devised by an airline pilot to keep necessary charts in sight for easy reference while reading critical flight instruments during approach and landing or on route. Top photo, takes from pilot's eye level, shows

the flight chart holder affixed to T49 Cessna wheel. Note instrument background easily visible. Lower photo details the components. Inset at O. M. Geo. Trans World Airlines' approval of flight, Atlanta, N. Y.

SHORTLINES

► **Bonanza Airlines** plans extensive fleet from Reno to Las Vegas and Henderson, ... like a first rate rate estimated by CAB to pay \$177,948 a year, of which all but \$15,000 is subsidy.

► **British Overseas Airways** is still studying its flight scheduling of the Comet, but reportedly cannot see it as a sole future because of commercial cost of scheduling stations, equipment and operation is prohibitive unless a big airline fleet is

using the service along a particular route.

► **Chrysler & Southern** and TWA is landing service New York-Boston is urged by CAB because control, although customer recommended recommendation after CAB decision on the Delta-G & S merger. That merger could not allow interchangeability, because control.

► **Civil Aeronautics Board** is studying the plan from the Apr. 29 FAA Stationers crash site in Brazilian jungle report tail and rubber were five ft from main wreckage "backing

that they had broken from aircraft in the no power to ground impact." Furthermore, the underbody No. 2 engine and prop apparently must be even further away.

► **Colonial Airlines'** stockholders approved the Eastern Air Lines merger agreement almost unanimously, although they had failed of a two-thirds majority to approve a National Airlines merger. Company merger hearings at CAB Oct. 27 will be held at four weeks after Eastern and National fight for CAB preference to buy Colonial. Otherwise use CAB because control having National.

► **East African Airways, BOAC** officials, is replacing its two Lockheed with one DC-3.

► **Hera, Spanish airline**, plans a 3,363 mile, six-engine, aircraft from Canary Islands to Puerto Rico using compound-engine Super Constellation. The plane has a maximum 3,820 mi cruise range plus several full reserves, Lockheed says.

► **KLM Royal Dutch Airlines** has moved its North American division executive office to Daily News Building, New York.

► **National Airlines'** annual stockholders meeting elected three new directors, replacing persons minority opposition group headed by W. K. Jacobs, who resigned after a proxy battle last June. New directors are J. W. Glass, J. C. Bremer and B. O. Bielen.

► **Pan American World Airways** has selected "Super G" DC-4B aircraft service from N. Y. to Johannesburg cutting 64 hr from its previous scheduled time on Constellation.

► **Panair do Brasil** paid on DC-3 after it an effort to subsidy need claimed by Panair in its application for an increased mail rate to carry March 1962 cuts, CAB because control and the Post Office says. They say the rate was not "unreasonable" before Panair stopped its mail rate, Panair claims that profit was fine and clear before the mail rate had been proposed.

► **Slack Airways** reports CAB to file a new freight charter rate above 79¢ costs a C-46 plane rate and above the old 77¢ cost rate. CAB allowed Flying Tiger to break the 77¢ rate because Navy requested it, Slack says.

► **Texas World Airlines** now operates six 599 transcontinental aircraft flights a day from New York-Mexico to Los Angeles and three to San Francisco.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

STAFF ENGINEER

ARMAMENT

Attractive opening for a staff specialist in aircraft armament design and installation. Duties include responsibility for evaluating various aircraft armament systems, and the preparation of basic armament design specifications.

Applicant should have experience as engineering specialist in large design organization. Job requirements include engineering degree plus eight to ten years experience in various aircraft armament fields such as aircraft guns, ammunition chutes, ammunition feeders (including related pneumatics) and rockets (including pack design).

All inquiries will be held confidential. For further information contact

ENGINEERING PERSONNEL SECTION

CHANCE VOUGHT AIRCRAFT

P. O. Box 2007 Dallas, Texas



DIVISION OF UNITED AIRCRAFT CORPORATION

California Opportunity

For Acoustics and Vibration Engineer

Qualified to conduct tests and analyze problems in acoustics and vibration fields related to aircraft and associated products.

Salary open and dependent on experience and ability.

Contact Mr. W. H. P. Downs, Room 2000 Ocean Park Boulevard, Santa Monica, California. Phone: ED 6-6445, Extension 508.



DOUGLAS AIRCRAFT COMPANY, INC.
SANTA MONICA, CALIFORNIA

PROJECT ENGINEER FOR AUTOMATIC FLIGHT CONTROL DEVELOPMENT

Excellent position for a graduate engineer with a good background in automatic flight control systems and experience in system engineering and control systems. Knowledge of theory of aircraft stability and flexibility with experience in system analysis, design, and development of flight control systems. Experience in system analysis, design, and development of flight control systems. Experience in system analysis, design, and development of flight control systems.

LEAR, INC.

Local Office
11111 West Park Blvd.
Los Angeles 44, California

THE NEW SCIENTIFIC RESEARCH LABORATORY OF THE FORD MOTOR COMPANY

Has openings for

Acoustic
Cryogenic
Heat Transfer
Control
Design

ENGINEERS

To research, design and develop automotive test facilities and equipment. To research, design and develop automotive test facilities and equipment. To research, design and develop automotive test facilities and equipment.

FORD MOTOR COMPANY

Engineering Personnel
Dearborn Division
West Dearborn, Michigan

TEST ENGINEERS AERODYNAMIC COMBUSTION DESIGN ENGINEER ELECTRONIC ENGINEER

Hired by the University of Southern California for operation of the Aerodynamic Test Division, Naval Air Warfare Test Center, Point Mugu, Calif. Excellent opportunities exist for advancement at this new Windtunnel and Combustion facility.

Apply to

UNIV. OF SOUTHERN CALIF.
ENGINEERING CENTER
935 W. 37th Street
Los Angeles 7, Calif.

If You're Up-In-The Air ABOUT YOUR FUTURE

REMEMBER

PIASECKI

(Pronounced PIE-SEN-EE)

THE PIONEER BUILDER OF TRANSPORT HELICOPTERS

—one of the most rapidly expanding companies in the world, with a present need for its people in its major design effort PLUS an upward just now commercial market for aircraft, ROTOR completion and good pay too—

ENGINEERING DESIGNERS & DRAFTSMEN

—with aircraft experience in Airframe Controls, Electrical and Power Plant Installations

If you want to get the facts about a development opportunity where you can keep your feet on the ground, tell us in detail about your qualifications for these openings. Write:

MR. W. J. HATCHER
Employment Manager

PIASECKI HELICOPTER CORP.

MORTON, PA.
A Philadelphia Suburb NEXT SMITHBORO



IS

- **ROCKET**
- **PROBET SHIP**
- **TWIN ENGINE ROCKET**
- **AMERICAN AIRCRAFT POWER TURBOJET**
- **SUCCESSFUL AMERICAN DESIGNED HIGH ALTITUDE ROCKET**

IN OPPORTUNITY FOR ENGINEERS

Intersecting Career Work On Guided Missiles, Rockets and Conventional Aircraft Is—

STRUCTURAL DESIGN

Airframe and Mechanical

INVENT ENGINEERING

Analysis control and new design studies

Dynamics Analysis & Test
Vibration (static and dynamic loads)

Flight Test Instrumentation

Comprehensive background in AERONAUTICAL, MECHANICAL, CIVIL, ELECTRONIC, MATHEMATICS or PHYSICS SPECIALISTS desirable for Design and Group Engineer positions. Excellent opportunities also available for Jr. Engineers.

Substantiated resumes giving full details of education and experience. Personal interview will be arranged.

Martin

THE GLENN L. MARTIN CO.
101 Technical Employees
BALTIMORE 3, MD

Presented in *Aircraft* since 1958

MC DONNELL AIRCRAFT CORPORATION

Invites you to build your future with a company young in years, young in spirit and ideas.

Opportunities In Engineering
Design Engineers
Aerodynamicists
Servomechanism Engineers
Stress Analysts
Electronic Specialists

Manufacturing Positions
Production Planners
Field Representative—
Perkoaching
Methods Engineers
Master Planners

Feeling
Tool Designers
Tool Planners

Strong college backgrounds with experience background. Opportunities for advancement with quality salary ranges. Complete employee benefits.

Write to:
Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

Technical Placement Supervisor
McDonnell Aircraft Corporation
Box 516 St. Louis 2, Missouri
DON'T LET YOUR FUTURE FOR FLIGHT

master scheduler

Several years' experience in the aerospace industry. Must be familiar with standards and use of graphs, charts and tracing. Must be experienced in planning and scheduling of house production capabilities. Should be able to project and discuss existing labor and labor resources budgets.

LIBERAL MOVING ALLOWANCES

Send Complete Resume and Salary Requirements to:

EMPLOYMENT MANAGER

CHASE

AIRCRAFT COMPANY, INC.

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

WEST TRENTON, NEW JERSEY

INSTRUMENTS

Authorized Factory Sales and Service

for

*Eclipse—Pioneer

*Kollsman

*U. S. Gauge

C. A. Approved Repair Station

73544

Contractors in U. S. Air Force

Our stock of instruments is one of the largest in the East.

IMMEDIATE DELIVERY

CALL & WRITE & WRITE

INSTRUMENT ASSOCIATES

Telephone: Great Neck 4-5147

101 Great Neck Road, Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.

Teletype: WLS Great Neck, N. Y.



R-2800's

31°-51°-75°

prices, on request

These engines are 2800 H.P. (2800 H.P. C.A.A. approved) and have low ACES C.A.A. approved maintenance. Subsequent engine failures in these planes are minimal. They have also been tested in our engine test cell and have been approved for best in class.

C.A.A. APPROVED OVERHAULS

- 1248-41 overhaul only
- 1248-41 overhaul only

ALL WORK AND ENGINE OILS DONE OUR OWN WAY

AIR CARRIER ENGINE SERVICE, Inc.

1st Airport South
2000 South St. 2000 P. O. Box 955, Miami 40, Florida
Cable: "AIRCARRIER"



FORMER

EASTERN AIRLINES

DOUGLAS DC-3's

AVAILABLE FOR LEASE

We have 10 DC-3's available for immediate lease to corporations and airlines. DC-3's Passenger and Cargo Airplanes. These aircraft are fully equipped for scheduled airline operation. Executive versions also available. Call us for more information on the advantages of leasing. We can give you all the advantages of ownership without large capital expenditures. We show you the advantages of our corporate leasing plans. Our 20 years of aviation knowledge is at your disposal. Airplanes available for inspection at our Van Wayne or Miami Fla. base. Available with Wright or P & W engines.

REACH
Miami, Fla.
1934 C of C 646



MIAMI
Phone
9-7218

P & W 2800 Engine Parts

7-11-53

Quincy & 3024 Vetus
Falls Park & Creek Cross
Creek Station & Prop. Shop

New and Serviceable
TRANSPORT AIRCRAFT—OVERHAUL

AIRLINE EQUIPMENT CORP.

Newark, New Jersey, N.J.
Quincy, N. Y.

LOCKHEED LODESTAR

Now in major overhaul. Can be finished your specifications. One of last built. 3-3133 285A. Engines.

ENGINEERING AND MANUFACTURING
CORP.
P. O. Box 419
Quincy, Texas

Spineless Pussyfooting

Some red-blooded officers in the Pentagon can hardly be blamed if they "boiled over" privately at the two latest Russian missions perpetrated on the U. S. Air Force on the same day, Oct. 8.

Two Russian jet fighters made menacing passes at an unarmed C-47 hospital plane flying between Frankfurt and Berlin. One fighter loosed machine gun bullets near the transport. Our hospital ship declined into clouds and escaped undamaged.

In the north Japan sees an unarmed B-28 downed. Radar observations indicated a sea-UN plane intercepted the bomber's course just before the B-28's radar image disappeared and ground witnesses saw a plane fall into the sea, screaming smoke.

Earlier, two other U. S. planes disappeared near Russian borders. Later, posters appeared in Russia in connection with special awards to Russian pilots for "disgraced" service. Was it coincidence that the planes pictured were the same types in the two planes we lost?

Unless these aircraft flew beyond Russian borders, which we doubt, we—like the men in the Pentagon—and many U. S. citizens—are wondering how much longer this nation will continue to accept this load of stoicism so easily? The more we take of this kind of stuff, the more of it we are likely to get, the Red Doctor's mentality being what it is.

There are many retellings for short of war which we can and should take. Some would have Russia, conventionally and otherwise, and a few of our respected military people believe this realistic response might ease the Communist trigger itch.

Our State Department demanded government attention to run up an unenviable, unprecedented record of pussyfooting and appeasement, for the rest of the world to see. A spate of Administration capitulations on our part of war is an alibi for failing to uphold national honor and international law.

More Stalling Tactics

While Civil Aeronautics Board's Chairman restricts public praise in his speeches for the Board's efforts in promoting aircraft service among the certificated airlines, his agency continues its perfect record by stalling on certifying even a single unincorporated international aircraft carrier.

Last week, in the repeated U. S.-Middle East air-freight case, the Board decided once again to throw overboard the problem here and the untold thousands of dollars spent by applicants and the Board itself in hearing cases until held and completed. It will start them all over.

It repeats its delaying tactics, which are so obvious in its current re-investigation of the non-scheduled coach passenger carrier problem, to determine if there is a "need" for this type of service.

American Aviation Daily now says this proceeding will cost "tens of millions of dollars" and will take four or five years, with the average total monthly cost for transcripts already running between \$15,000 and \$20,000.

This is how CAB costs public money. This is how it invests legal expenses of certificated as well as uncertificated airlines. This is how it wastes new coach service to the public. It is also an example of how Russia start on an kept freely circulating about CAB, and the extent of its public interest. Here is more new information made for group cohesion and authors of such books as "How to Get Rich in Washington."

Our Transport Editor, F. Lee Moore says the Board's decision to reopen the Middle East air-freight case is all corners assure at least another year's deliberation. The outlook at this moment is that the case will be decided for 1954 settlement.

Thus, foreign air carriers are given a clear field to increase their cargo leadership over the Atlantic, and the Defense Department, eager to build up the nation's air-freight fleet, can look forward to another case of too little and too late. Not to mention the public's interest in better and cheaper U. S. flag line freight service, that we believe could be affected by unsubstantiated claims.

Reporting on Air Safety

Alexander Wren's recent appointment of Alexander McNulty as Aviation Safety Editor has resulted in gratifying response.

Both the Aircraft Industries Assn. and the Air Transport Assn., for example have circulated memoranda to safety people in consulting and airline companies announcing the appointment and urging cooperation.

"For many years the AIA and ATA members, technical and management personnel, have deplored the tendency of the press to emphasize the industry's safety problems rather than its safety initiative and progress," F. W. Norris, Aircraft Industries Engineer of Boeing Airplane Co., wrote in a memo to fellow safety committee members, with other aircraft manufacturers.

"Such editorial and reporting policies have undoubtedly influenced critical attitudes in some legislators and have encouraged the excessive of federal regulatory activity," Norris said.

"Little can be done to prevent publication of air accidents and disasters. There is much to be done to counterbalance the effect of such publicity. Every manufacturer and operator has evolved many schemes in practices which are intended to reduce trends and advance flight safety. Effective publicity on such features which recognize in industry without comparison can, if not convinced, reduce the trend toward mandatory detailed safety rules and regulation.

"A step in the direction of improved public, industrial and governmental relations for aviation has been taken by Alexander Wren in the designation of Alex McNulty as Aviation Safety Editor. By encouraging a long-range program of good reporting on the many worthwhile accomplishments in this field, we should help to create a less critical atmosphere in which to continue our cooperative efforts toward a more workable airworthiness regulatory system."

—Robert H. Wood

for strato stress

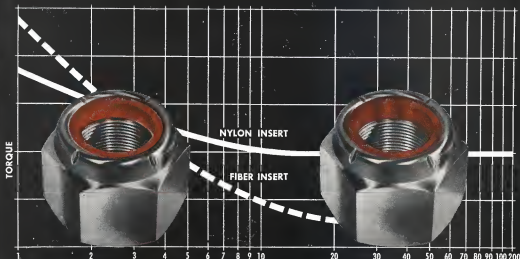
aluminum extrusions

For strato stress measuring or ground take-offs, America's aircraft industry depends on aluminum extrusions. Those fabricated by Harvey benefit from the homogenizing process—an extra assurance of maximum resistance to stress and fatigue. We at Harvey consider it a privilege to serve an industry which is helping to guard America's freedom. Whether at payload, Harvey-produced extrusions make good planes better. Many of America's greatest plane manufacturers are making constant use of our consulting staff. A Harvey Field Engineer is at your service.

HARVEY Aluminum

DESIGN OF HARVEY MACHINE CO., INC.
FARMACIA, CALIFORNIA
BRANCH OFFICES IN PRINCIPAL CITIES

An independent facility producing special corrosion, pressure forgings, for steel forging mills, tubing and other mill products



Elastic Stop Nuts with the fiber locking insert assure satisfactory locking torque characteristics for normal reusability requirements.

New nylon locking inserts, now available for any standard type or size of Elastic Stop Nut, will provide more than 200 re-use cycles.

How do you measure Reusability?

UP TO FIFTEEN TIMES?

For assemblies that must be locked in place, Elastic Stop Nuts with fiber locking inserts guarantee a permanently secure grip—plus ample reusability to cover most normal maintenance requirements.

For assemblies that must be disassembled and reassembled five, eight, ten, or more times during normal use, fiber insert Elastic Stop Nuts make the ideal self-locking fastener.

When an Elastic Stop Nut is run on a bolt, the Red Elastic Collar hugs the bolt—actually makes a skin-tight fit against the entire contact length of the threads—and this controlled torque firmly resists vibration or shock. When the Elastic Stop Nut is removed from the bolt, the natural resiliency of the Red Elastic Collar is your guarantee of continuing torque when the nut is reapplied.

MORE THAN FIFTEEN TIMES?

Now, for assemblies that require constant adjustment or frequent disassembly for checking and maintenance, ESNA offers all standard types and sizes of Elastic Stop Nuts with the new nylon locking inserts.

Reusable up to 200 times with remarkably constant torque characteristics, these new Elastic Stop Nuts offer the one-piece construction, the shock resistance, and the moisture-seal features that many manufacturers now depend upon in the standard Elastic Stop Nuts.

One of these Elastic Stop Nuts is probably the solution to your most troublesome fastener problem. It will pay you to look into the self-locking performance of Elastic Stop Nuts. For information, write for a new, free booklet, **Elastic Stop Nut Corporation of America**, 2330 Vauxhall Road, Union, New Jersey, Dept. N5-1025.

ESNA
TRADE MARK

ELASTIC STOP NUTS



HIGH
TENSILE



ANCHOR



HIGH
TEMPERATURE



SPLINE



CLINCH



GANG
CHANNEL



NYLON
CAP

NYLON AND FIBER INSERT TYPES ARE QUALIFIED TO SPEC. AN-X-5